

A PICTORIAL SURVEY OF CURRENT PRACTICE, EQUIPMENT AND MATERIALS

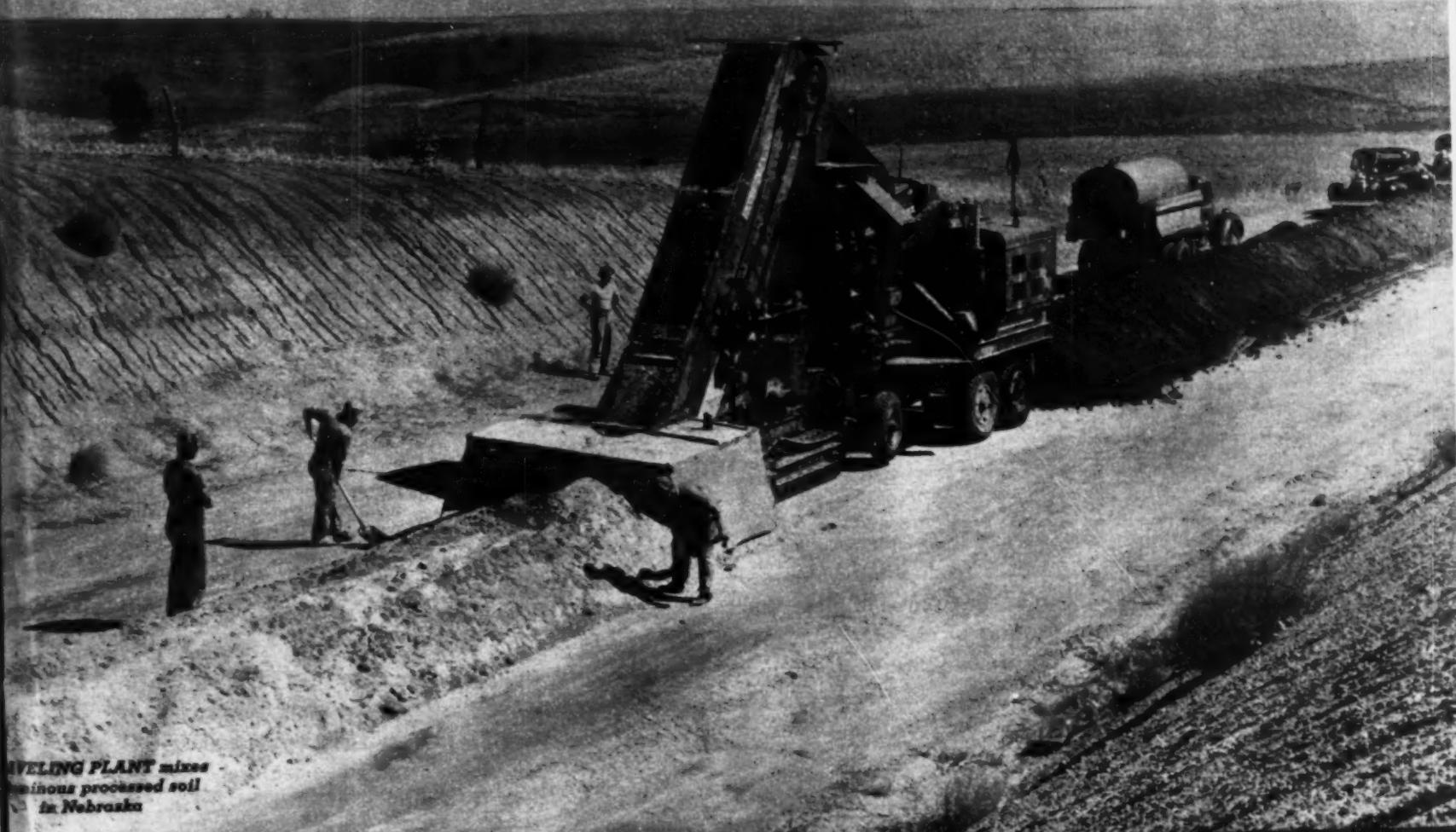
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TECHNOTRONY DEPT

construction Methods

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WELDING PLANT mixes
minous processed soil
in Nebraska

ROAD BUILDERS' NUMBER — JANUARY, 1940

First Concrete Paving
on Pennsylvania Turnpike

Sand Asphalt Cold Mix

Construction in Latin America

Tunnel Bottleneck Changed To Deep Open Cut
By JOHN D. ALLAGHAN

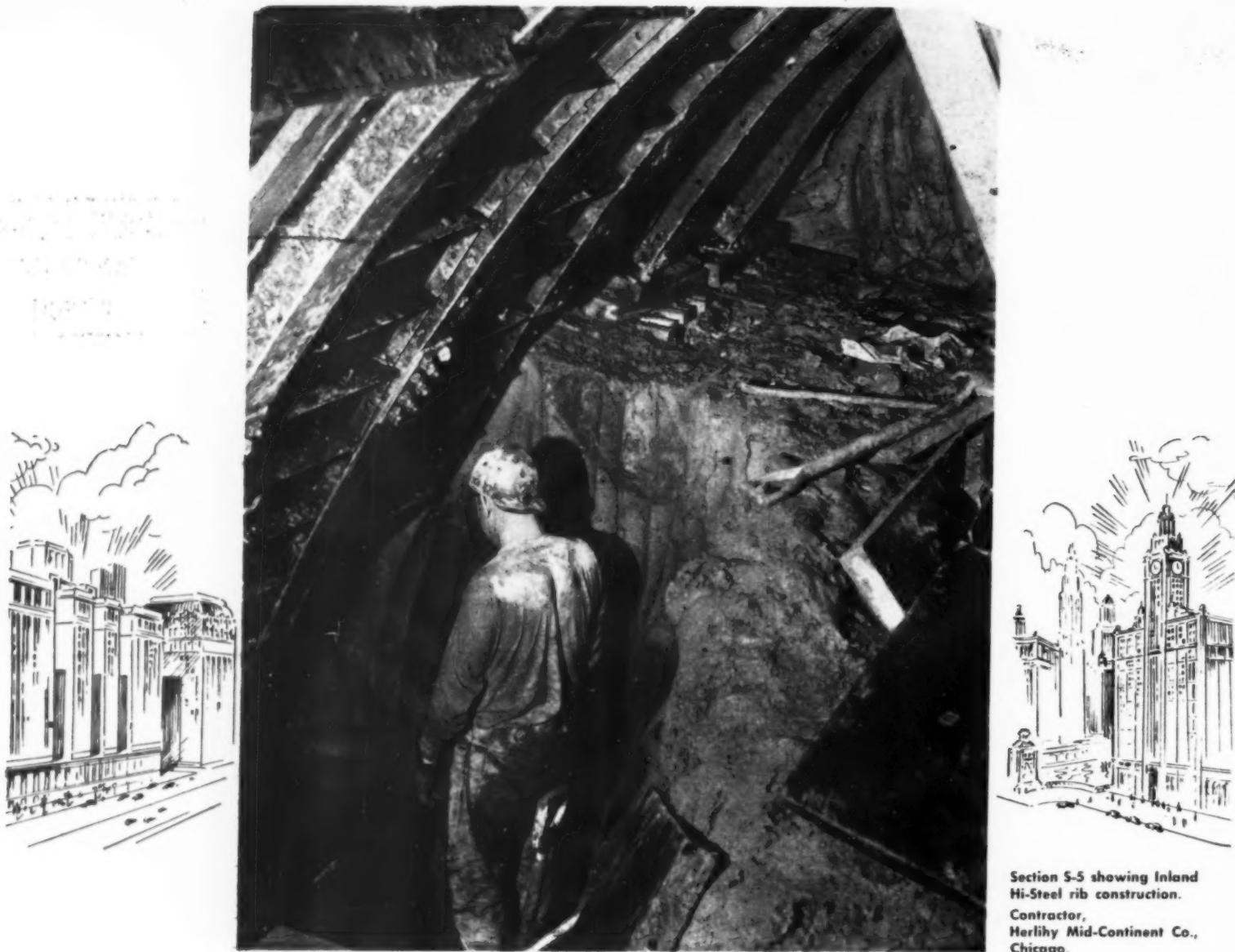
Belt Parkway — A 31-m.
Concrete-Paved Six-Lane Non-Stop Route

White Cement Curbs
With Light-Reflecting Surfaces

Bituminous Treatment
Makes Road Shoulders Safe
By S. J. MATHE

Modern Brick Paving
By T. SCHROEDER

Asphalt Penetration on Waterbound Base



Section S-5 showing Inland Hi-Steel rib construction.
Contractor,
Herlihy Mid-Continent Co.,
Chicago.

Chicago's New Subway Takes Shape with Special Steel Sections Made by INLAND

• Tunneling for Chicago's new subway goes forward rapidly—and here again Inland engineers have co-operated from the early planning stages.

After a thorough study of the problem, special I-Beam arch ribs and liner plates were designed for the job by Inland engineers—permitting quicker setup and a less costly method of sustaining earth pressures prior to the placing of concrete. Plates were designed and tested for pressures of 4,000 lbs. per square foot.

Liner plates and ribs transmit pressure into trusses, held apart by timber cross braces, placed

high enough to allow ample working space. Trusses are made of Inland Hi-Steel (high strength low-alloy), to keep weight to a minimum so that they may be erected and moved by hand during tunneling operations.

Inland engineers, working closely with the contractors, have helped them develop a safe and economical method of handling this part of the job. This practical co-operation is typical of Inland and is a good indication of the engineering service you can expect from Inland on any type of construction work involving the use of steel.

TECHNOLOGY DEPT.

INLAND STEEL CO.

38 S. Dearborn St., CHICAGO • District Offices: MILWAUKEE • DETROIT • ST. PAUL • ST. LOUIS • KANSAS CITY • CINCINNATI

SHEETS STRIP TIN PLATE BARS PLATES FLOOR PLATES STRUCTURALS PILING RAILS TRACK ACCESSORIES REINFORCING BARS

CURRENT JOBS

... and Who's Doing Them

HIGHWAYS AND BRIDGES

Among recent highway contract awards are the following: Alabama: \$256,054 to **H. E. Wolfe**, St. Augustine, Fla. California: \$326,966 for highway and viaduct to **Granfield, Farrar & Carlin**, of San Francisco; \$238,837 to **Hemstreet & Bell**, Marysville, Calif.; \$240,832 to **Harms Bros.**, Sacramento, and **N. M. Hall Sons**, Berkeley, Indiana: \$196,539 to **J. C. O'Connor Sons, Inc.**, Fort Wayne, Mississippi: \$227,103 to **Carlton Contracting Co.**, Albany, Ga.; \$287,102 to **Weymouth Construction Co.**, Milwaukee; \$266,539 to **Wesco Construction Co.**, Chattanooga, Tenn. New York: \$194,638 to **Nicholas Di Menna & Son**, New York City; \$880,514 to **Petracca & Banks**, of New York. Pennsylvania (Turnpike Commission): \$442,644 to **Baldwin Bros. Paving Co.**, Cleveland, Ohio; \$287,414 to **W. L. Johnson Construction Co.**, Hicksville, Ohio; \$307,600 to **Union Paving Co.**, of Philadelphia; \$978,299 to **Union Construction Co.**, of Des Moines, Iowa; \$615,043 to **A. Eidemiller**, of Greensburg, Pa.; \$508,919 to **States Engineering Co.**, Rapid City, S. D. Ohio: \$804,658 to **Holmes Construction Co.**, Wooster, Ohio; \$513,679 to **L. T. Cisler & Sons**, Marietta, Ohio; \$447,433 to **A. J. Balles**, of Norwalk, Ohio; \$407,349 to **General Asphalt Paving Co.**, of Canton, Ohio. Texas: \$242,937 to **Texas Bitulithic Co.**, of Dallas; \$198,924 to **F. M. Reeves & Sons**, of Bishop, Texas. Washington: \$396,293 to **General Construction Co.**, of Seattle.

Low bidder for steel truss bridge over Sacramento River was **United Pipe Corp.**, of Los Angeles, with price of \$673,046. **Missouri Valley Bridge & Iron Co.**, of Leavenworth, Kan., received \$597,272 bridge contract in Louisiana. Trinity River bridge in Texas went to **P. & B. Construction Co.**, of Fort Worth, for \$423,288. Grade crossings in Orange County, New York, were bid in for \$306,906 by **Lane Construction Corp.**, Meriden, Conn. Salinas River bridge in California will be built by **Utah Construction Co.**, of San Francisco, for \$210,775.

HEAVY CONSTRUCTION

Bay front improvements at Corpus Christi, Tex., are under construction by **Jay DePuy**, of San Antonio, for \$1,150,000. Railroad relocation in Colorado costing \$1,058,668 will be handled by **Western Contracting Co.**, of Sioux City, Ia. Navy airplane hangars at bases in Massachusetts and Rhode Island, will be built by **Bethlehem Steel Co.**, Bethlehem, Pa., for \$964,350. **Minder Construction Co.**, of Chicago, received \$750,860 contract for subway stations in that city.

Dredging contract for \$774,410 in Providence, R. I., was awarded to **Arundel Corp.**, of Baltimore, Md. **Standard Dredging Co.**, of Los Angeles, Calif., received \$788,557 contract for dredging in San Diego harbor. At Fort Supply, Okla., **Uvalde Construction Co.**, of Dallas, Tex., will build \$586,416 reservoir. Irrigation ditches and siphons in New Mexico, went to **Utah Construction Co.**, Ogden, Utah, for \$562,518. Successful bidder for outlet works at Denison dam across Red River in Texas, was **C. F. Lytle Co., Inc.**, with price of \$3,470,640. Sepulveda dam near Los Angeles, Calif., will be built at cost of \$3,121,268, by **Jahn-Bressi-Bevanda & Gordon**, of Los Angeles. Low bidder for Indian Rock dam at York, Pa., was **Benjamin Foster Co.**, of Philadelphia, with price of \$1,206,104. For sewage treatment plant in Omaha, Neb., **Parsons Construction Co.**, local contractor, bid \$600,097. Sewage plant in New London, Conn., costing \$300,710 is under construction by **N. Benvenuti & Sons**, of New London. Filtration plant sub-structure contract in Chicago, went to **Michael Pontarelli & Son**, of Chicago, for \$3,616,650. In Toledo, Ohio, filtration plant costing \$1,571,718 will be built by **J. A. Utley**, of Royal Oak, Mich.

CONSTRUCTION METHODS was founded in 1915, under the name of **SUCCESSFUL METHODS**, by the Manufacturers' Publicity Bureau, Inc., of Chicago, representing a group of non-competing manufacturers of construction equipment. Charles R. Thomas, editor of the first few issues, was succeeded by William J. Jaine. In 1926 the McGraw-Hill Publishing Company, Inc., of New York, purchased the publication, changing its name to **SUCCESSFUL CONSTRUCTION METHODS** in November of that year, to **CONSTRUCTION METHODS** in May, 1927, and to **CONSTRUCTION Methods and Equipment** in December, 1936. In October, 1939, the name **CONSTRUCTION METHODS** was resumed. All rights to the foregoing titles are reserved by the publishers.

Robert K. Tomlin was appointed editor of **CONSTRUCTION METHODS** in January, 1928. Vincent B. Smith is associate editor; Nelle Fitzgerald, assistant editor; and Paul Wooton, Washington representative.

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Construction Methods

A Pictorial Survey of Current Practice, Equipment and Materials

ROBERT K. TOMLIN, Editor Editorial Staff: Vincent B. Smith, A. E. PAXTON, Manager Paul Wooton (Washington), Nelle Fitzgerald

Established in 1919
A McGRAW-HILL PUBLICATION

ROAD BUILDERS' NUMBER

Appearing on the eve of the annual convention and Road Show of the American Road Builders' Association in Chicago this issue of **CONSTRUCTION METHODS** features subjects of highway interest.

Succeeding issues, of course, will deal with other types of construction.—EDITOR.

The HOW of it

- How **TRAFFIC SAFETY** was promoted by divisional fin of wire rope. — p. 49
- How **DUAL-DRUM MIXER** paved 4-lane turnpike. — p. 52
- How **SCREW SPREADER** distributed concrete for 12-ft. paved lanes of superhighway. — p. 52
- How **MIXING WATER** for paving mixer was delivered by 1,500-gal. tank trucks instead of pumps. — p. 52
- How **ROAD FORM PINS** were driven by air hammer. — p. 54
- How **SAND-ASPHALT COLD MIX** was prepared by traveling plant. — p. 56
- How **PAVEMENT EDGE** was trimmed to line by disk on moldboard of grader. — p. 57
- How **LATIN-AMERICAN ROADS** were built with U.S. equipment. — p. 58
- How **BELT PARKWAY** was built to provide 31-mi. non-stop route. — p. 60
- How **TUNNEL BOTTLENECK** was converted into deep open cut. — p. 64
- How **ASPHALTIC LINING** was applied to drainage ditch. — p. 66
- How **ROLLERS OF THREE TYPES** compacted plant-mix base. — p. 67
- How **TUBULAR SPREADER** distributed chemically treated grits on icy road surface. — p. 72
- How **BOGGING OF TRUCKS** in sandy soil was prevented by steel reinforcing mats. — p. 72
- How **CEMENT BOXES** were rigged on three-batch trucks. — p. 73
- How **LUBRICATION** of hauling equipment was done with pressure equipment. — p. 75
- How **SOIL PROCESSING** was done with cement, asphalt and tar. — p. 80
- How **VIBRATORY PAVING TUBES** saved cement. — p. 83
- How **REFLECTING CURBS** of white cement guided night traffic. — p. 84
- How **ROAD SHOULDER** were made safe by bituminous treatment. — p. 86
- How **BRICK PAVING JOB** employed novel expansion joints. — p. 88



"Something like Coney Island, isn't it!"



"Mind if I try to shake off a few pounds?"



"Swell idea of yours, Joe, renting this from the coal company for a ski tow."



POURED AT 28°
in 1928

TYPICAL 'INCOR' JOB SHOWS 2-WAY SAVING: (1) DEPENDABLE EARLY STRENGTH; (2) PROVEN LONG-TIME DURABILITY

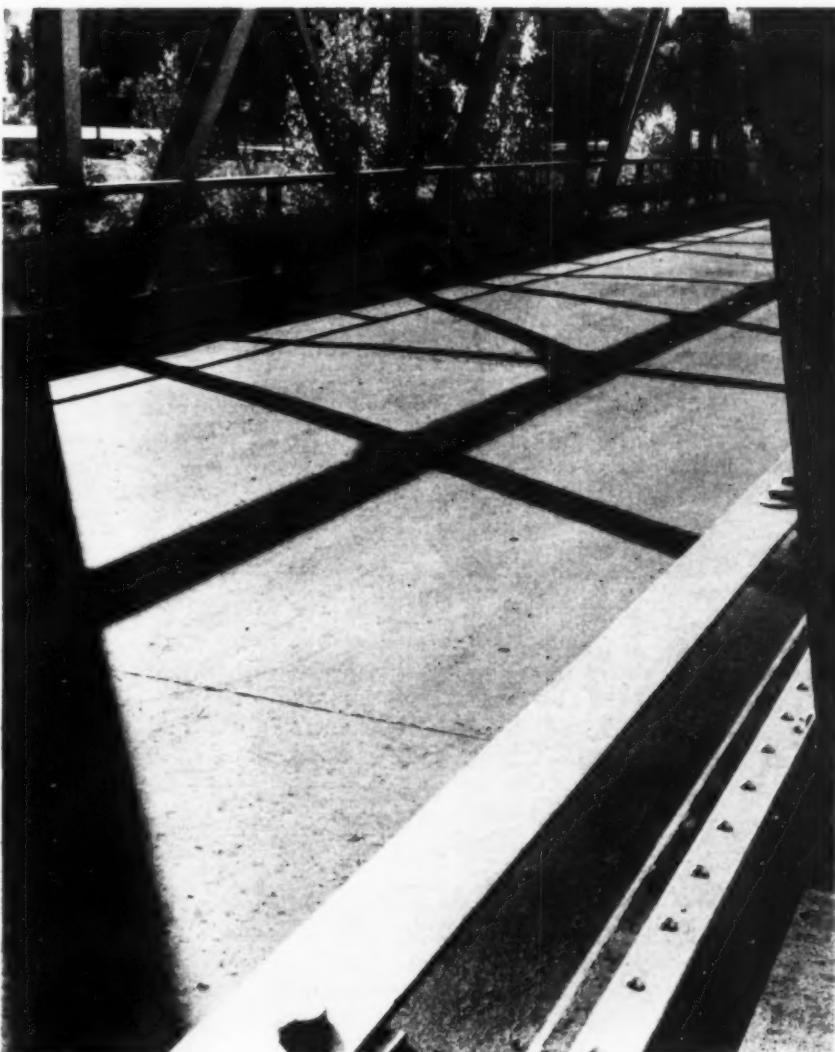
"HIGH early strength? Sure! But what about long-time durability?" That is what the engineers said, back in November, 1928, when the 'Incor' concrete deck-slab was placed on Hastings Bridge, St. Johnsbury, Vt. For those were days of pioneering — when 'Incor' was bucking the tide of established habit.

Mixing water and aggregates were heated; protection promptly supplied, and maintained for 48 hours. The contractor saved \$300 through reduced heating costs . . . and got as fine a looking piece of concrete as anybody could want.

Now, what about long-time durability? Eleven years of hard, steady wear . . . New England winters . . . tire-chains . . . freezing and thawing. But 'Incor' concrete is still in first-class condition. Typical 'Incor'* performance.

Written certificate with every shipment guarantees quality equal to or exceeding standard specifications. Quality you can depend on — today, tomorrow, and through the years. Write for copy of "Cold-Weather Concreting." Lone Star Cement Corporation, Room 2261, 342 Madison Ave., New York. *Reg. U. S. Pat. Off.

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LONE STAR CEMENT CORPORATION
MAKERS OF LONE STAR CEMENT . . . 'INCOR' 24-HOUR CEMENT

These Euclids are Built to
TAKE IT
AND PAY A PROFIT



THE NEW 18-YARD
BOTTOM-DUMP EUCLID
Gas or Diesel Power

This **18**-yd. Euclid Will Write a
NEW CHAPTER IN 1940 HAULING COSTS

GREATER CAPACITIES » » » MORE POWER

Out of the experience of the past—out of countless miles of actual job-performance—comes a new Euclid pioneering the road to lower hauling costs. Built bigger and tougher for bigger and tougher jobs, the new 18-yard unit gives contractors still greater savings on earth-moving in a big way. 200-horsepower engine, supercharged diesel or gas type . . . newly developed air-wind unit for controlling dumping gates . . . greater full-capacity size—all contribute to the writing of another chapter in Euclid's book of consistently greater hauling profits.

Just as Euclid gave earth-movers the first successfully

different hauling machine, so Euclid continues to lead the field with constant improvements for dollar-saving performance. In the past, economies under the loading unit, on the haul road, and on the fill established the superiority of fundamental Euclid principles . . . now the 18-yard unit arrives to top even this standard of fast performance.

Take this opportunity to make Euclid's "newest" your key to lower hauling costs in 1940. Discover in what this bigger unit can mean in the most practical terms of all . . . those of cash saved!



THE EUCLID ROAD MACHINERY CO.



MODEL F BOTTOM-DUMP EUCLID

13-yard capacity
(Water Level)
Gas or Diesel Power



MODEL K BOTTOM-DUMP EUCLID

8-yard capacity
(Water Level)
Gas or Diesel Power



MODEL K REAR-DUMP EUCLID

8-yard capacity
(10 Tons)
Gas or Diesel Power



MODEL F REAR-DUMP EUCLID

10-yard capacity
(15 Tons)
Gas or Diesel Power

See the complete Euclid line
at the Chicago Show
SPACE 117

Rear-Dump EUCLIDS

Nationally Accepted
for Stamina and Power

Whether they're hauling overburden at lower costs from an anthracite mine at Locust Gap, Pennsylvania... or iron ore from the Louise Mine near Crosby, Minn., at the rate of 58 long tons per working hour... or moving rocky material over sharp grades on the Skyline Trail, Rear-Dump Euclids satisfy tough, heavy-duty hauling needs. Why not make this owner satisfaction your "job-tested" guide for reduced hauling costs?

0 L E V E L A N D , O H I O , U . S . A .

Bottom-Dump EUCLIDS

Pacemakers
from Coast to Coast

Here's how Bottom-Dump performance cuts down job-time under good conditions and bad. At Vinita, Okla. ten Euclids, using a haul road partially covered by water, moved 1,117,500 yards in five months... on the Pennsylvania Turnpike, Euclids are the hauling favorites, over 100 units on the various sections... at Conchas, Dam, N. Mex., Euclids licked a temperature range of 10° to 108° and grades up to 20%. That's why at these points, as at hundreds of others, contractors' job-records tell our story for us. Euclids set a new pace for profits!

FROM THE DAILY REPORT OF A
TIGER BRAND WIRE ROPE ENGINEER

Mr. Jenks is one of those "I'm from Missouri" fellows. For years he's been pooh-poohing the idea that there's any real difference between wire ropes. But today I was ready for him. And when he went into that old song of his: "You've got to show me," I whipped out an old piece of Excellay that I'd picked up out in the field. "There," I told him, "is a piece of Excellay that far surpassed the service of the last ordinary rope used." Mr. Jenks looked it all over, inch by inch. He could easily see it was still in pretty good shape. Then he smiled. "Okay," he said, "I see what you mean. Send us a 700 ft. length and I'll let you know how it works out."

Yours,

Al

THEN I WHIPPED OUT AN OLD PIECE OF EXCELLAY



EXCELLAY *Preformed* WIRE ROPE

OUR engineers keep in constant touch with wire rope users in every industry. They believe that they can serve you best by seeing just how and where you use wire rope, taking down notes on how to prolong rope life so that they can give you money-saving tips. Whenever you're not fully satisfied with the performance of wire rope in any application, be sure to tell

one of these engineers about your problem. Circumstances, of course, govern how much can be accomplished to save you money through better wire rope performance, but of this you can be sure: The American Tiger Brand Wire Rope Engineer will not consider his job finished until he has solved to your satisfaction every problem involved in your use of wire rope.

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York

COLUMBIA STEEL COMPANY
San Francisco

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UNITED STATES STEEL

Premier Showing OF THE 1940 LINE OF **HEIL Quality Built ROAD MACHINERY**

BOOTH NO. A-6 1940 ROAD SHOW JANUARY 29-FEBRUARY 2
INTERNATIONAL AMPHITHEATRE • CHICAGO, ILL.

HEIL DIRTMOVING HEADLINERS FOR 1940

New—Heil Hydraulic Motor Scoop—A self pro-
pelled, self loading and unloading Hydraulic scoop.

New—Heil Hydraulic Trailbuilders and Bulldozers.

New—Heil Semi-Trailer Hydraulic Truck Scoop.

New—Heil Cable Scoop.
Complete line of Heil Dig-N-Carry Hydraulic Trac-
tor Scoops.

Heil Tamping Rollers.

Heil Hydraulic Dump Units—All Types—All
Capacities.



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THE HEIL CO.

HILLSIDE, NEW JERSEY

BIG BUSINESS AHEAD



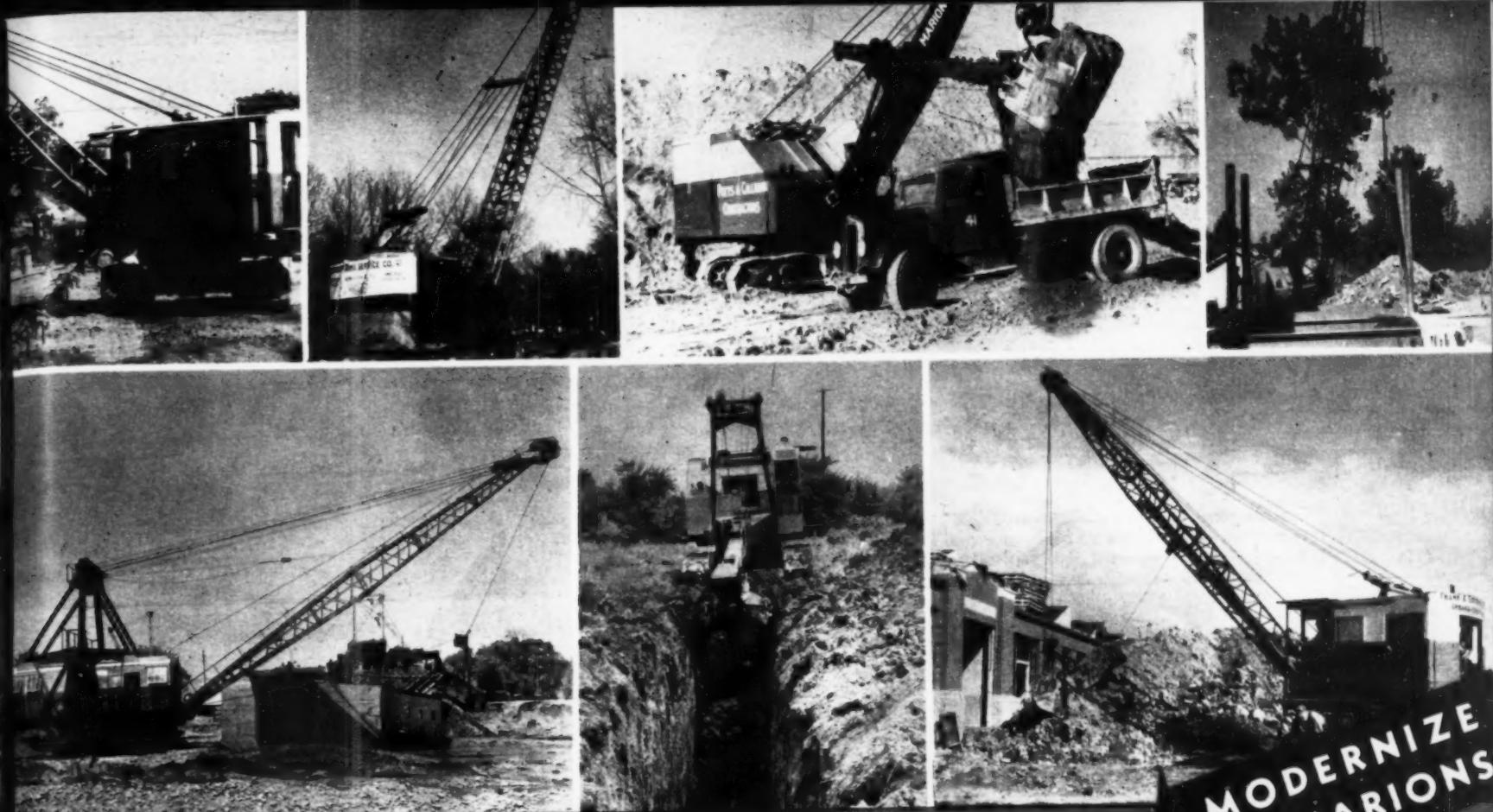
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PAGE 4 E VENTURE
PARK PHOTO FRAMES
WALLS & CEILINGS



NOVELS RACE

Bad Show
6



MAKE 1940 YOUR YEAR TO
MODERNIZE WITH • •

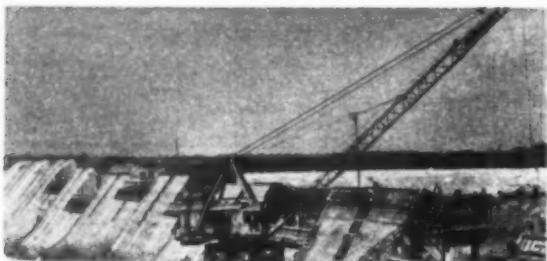
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DRAGLINES • CLAMSHELLS • CRANES • PULL-SHOVELS • WALKERS

The benefits to be derived from Modernizing with Marions are found in such important features as: self-cleaning, non-clogging long and wide crawlers; full control of hoist and crowd clutches; easy operating, smooth setting, positive contact rotating clutches; high lifting capacity; vacuum dipper trip; vacuum swing clutches; independent chain crowd; ample speed and power. There is a Marion of the right size and capacity from $3/4$ cu. yd. up for every material handling job, each machine being fully convertible. Write for catalog.

THE MARION STEAM SHOVEL CO. ★ MARION, OHIO, U. S. A.

Exclusive on this...



CONSTRUCTION of one of the spillways on the eastern end of Grand River Dam. One of the seven huge steam cranes, using Texaco Steam Cylinder Oil, with Texaco Crater Compound and Texaco Thuban for the wire rope and gears.



MIDWAY SECTION showing batching and mixing plant, storage silos and conveyors. Texaco lubricated throughout.



BUTTRESSES under construction. 52 of these, 150 ft. in height, are spaced over approximately a mile.

\$20,000,000 PROJECT IN OKLAHOMA

THE GRAND RIVER DAM at Disney, Oklahoma, is pushed ahead under fast schedule by Massman Construction Company, general contractors of Kansas City, Missouri.

To keep up this fast pace, the company relies on Texaco Fuels and Lubricants exclusively, even to Texaco Kerosine for lamps and heaters.

You, too, can make a "perfect score" with Texaco.

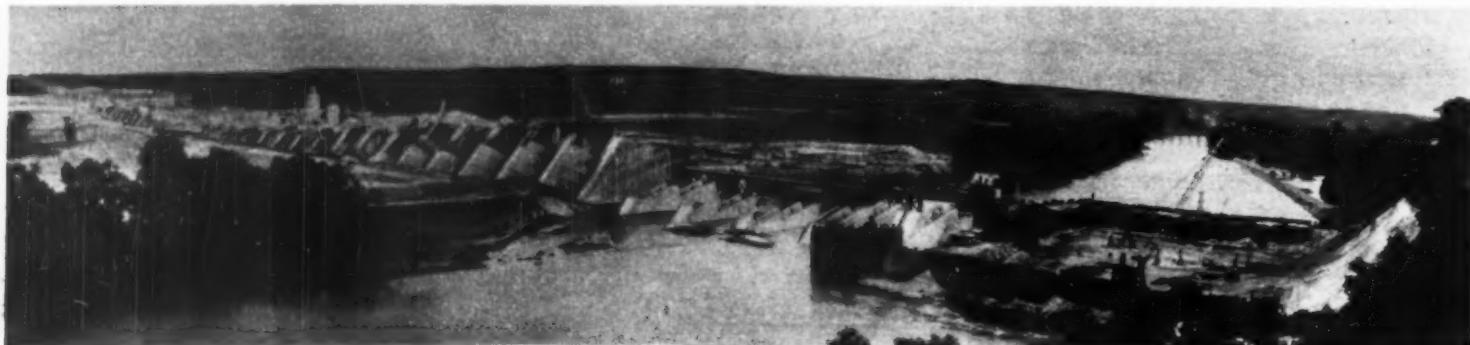
Texaco engineers are always ready to demonstrate that savings can be made with Texaco Marfak.

Phone the nearest of 2279 warehouses in the U. S., for Texaco engineering service and prompt deliveries, or write:

The Texas Company, 135 E. 42nd St., New York, N. Y.

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Texaco Dealers invite you to tune in The Texaco Star Theatre—a full hour of all-star entertainment—Every Wednesday Night—Columbia Network—9:00 E.S.T., 8:00 C.S.T., 7:00 M.S.T., 6:00 P.S.T.



GENERAL VIEW of the \$20,000,000 Grand River Dam Project at Disney, Okla., as of June 1939. Texaco Fuels and Lubricants, 100% help keep every piece of construction equipment throughout at peak condition.



TEXACO MARFAK

IGNITION INSURANCE!



You hear about American Bosch Magneto's with almost incredible performance records. Years of service with maintenance nil . . . under operating conditions that challenge their mettle to the limit. To insure similar ignition dependability on your power equipment, make certain that the magneto bears the famous American Bosch trademark.—American Bosch Corporation, Springfield, Mass.



AMERICAN BOSCH *SuperPowered* MAGNETO

BIG THINGS

Size, Speed and Reach



LONG HAULS are made with the Tournapull at speeds as high as 20 m.p.h. with loads ranging from 18 cu. yds. to more than 40 cu. yds. (according to Carryall size).

SHORT HAULS can be handled with the same Carryall Scraper, operated with tractor, by changing the yoke. The Tournapull and "Caterpillar" combination solves every earthmoving problem with a protected equipment investment assured. When the job calls for the longer-than-profitable tractor hauls, tractor may be used as pusher, pusher-Rooter or pusher-Dozer combination.

INTERCHANGEABLE



WHAT'S HAPPENED

to tractor tools

The TOURAPULL* is dynamite on wheels! To give you Carryall Scraper savings over *long* distances . . . beyond 2,500 feet, where tractor-scraper combinations leave off. Adequately powered for self-loading, it has "the speed of a truck—the pull of a tractor." Speeds range from 1.8 m.p.h. for pusher tractor loading to 25 m.p.h. traveling.

Two giant drive wheels, driven independently by clutches, give it amazing flexibility for maneuvering . . . for *wiggling* out of tough spots . . . for traveling softer, rougher ground than you imagined any rubber-tired earthmoving tractor could pull through. It follows true to LeTourneau tradition: it offers the lowest net-cost-per-yard over the long hauls . . . and *preserves* the natural Carryall characteristics of load-haul-dump-controlled spread, all in one cycle of operation.

Now available in two sizes, you'll find one of them suited to your long haul job.

With "Caterpillar" tractor-operated, extra-capacity LeTourneau Carryall* Scrapers on short hauls, Angledozers* and Bulldozers for clearing and pioneering, Rooters* for breaking all tough materials for easy Carryall and 'Dozer handling, you have a combination that can't be matched for low cost roadbuilding or any other excavation.

Your LeTourneau and "Caterpillar" dealer has the facts . . . and is ready to *demonstrate* the savings. Call on him, or write R. G. LeTOURNEAU, INC., Peoria, Illinois, Stockton, California.

At the Road Show

In Chicago, January 29 to February 2, plan to see the world's largest excavator—a TOURAPULL with a Carryall capacity of 46 cu. yds. (loose measure), as well as the smallest, a 3½-yard Carryall Scraper. It's part of the most complete line of modern earthmoving equipment available. You're invited to Peoria after the show to see a TOURAPULL demonstration.



Here's the Carryall that sets the pace for the modern pusher-scraper trend—the LeTourneau 30-yard heaped-measure 'RU', which offers as much as 100% extra pay yards for the same fixed hourly operating cost for booster tractor horsepower. Savings are proportionate in 12 other available Carryall models ranging from 3½ yards up.



... And did you know that now LeTourneau has extended undisputed Carryall and 'Dozer excavation economies over a 30% greater variety of materials—into the "shovel class"? The K3 Rooter, shown above, gives perfect breakage in any but solid rock . . . to save from 20% to 40% Carryall loading time . . . at but *one-third* the cost of blasting.



When it comes to sheer digging ability in *any* material, there's no substitute for LeTourneau 'Dozer natural digging suction that keeps tracks "geared to the ground" . . . plus the self-sharpening blade feature that gives LeTourneau 'Dozers the "edge" over ordinary digging tools in extremely hard rock like this. Lightning-like LeTourneau mechanical cable control widens its field of usefulness.

LETOURNEAU

extends Carryall* savings over 100% work range



SEE A REAL ROCK SHOVEL at the Road Show

Jan. 29-Feb. 2 International Amphitheatre



NORTHWEST ENGINEERING CO., 1728 Steger Bldg., 28 E. Jackson Blvd., Chicago, Ill.

NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS • SKIMMERS

We
Invite you -

STOP in and look us over. See these big Northwests with their powerful Welded Booms (and no Northwest Welded Boom has ever failed). Let us tell you about the Dual Crowd, the Cushion Clutch, the "feather-touch" Clutch Control and the other Northwest features.

Make our booth a place to rest! Meet your friends there! West end of Main Arena — we'll look for you.

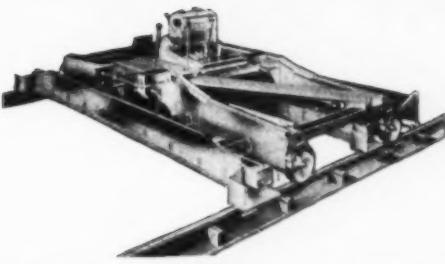
If it's a real
Rock Shovel —
you won't have
to worry about
output in dirt!

JAEGER OFFERS YOU

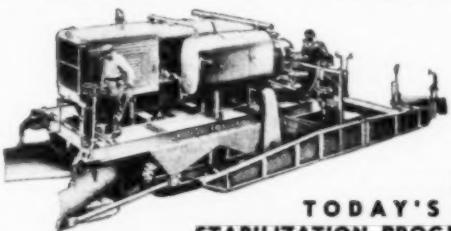
Jaeger is the Successful
Vibratory Finisher



—BETTER
MACHINES and
METHODS for
TODAY'S
JOBS!



THE HIGH PRODUCTION TYPE "D" FINISHER, with capacity exceeding dual-drum or tandem paver outfits, with "velvet touch" smoothness, automatic power lift and the flexibility of steam obtained with inexpensive gas power, has become the preferred finisher in numerous states. Ask also about new low cost Widening Finisher—a real money-maker!

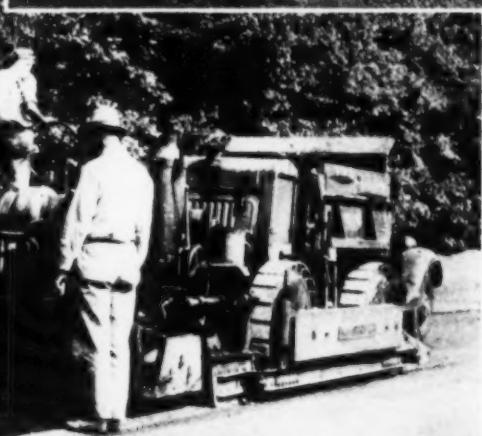


FOR
TODAY'S BIG
STABILIZATION PROGRAMS
THIS MIX-IN-PLACE ROAD BUILDER thoroughly mixes up to 16 cu. ft. windrows at rate of 160 to 180 tons an hour. Many hundreds of miles of new base, top and tread work, from Minnesota to Mexico, prove huge economies and highest quality of mix. Popular priced tractor drawn models for light retreads.

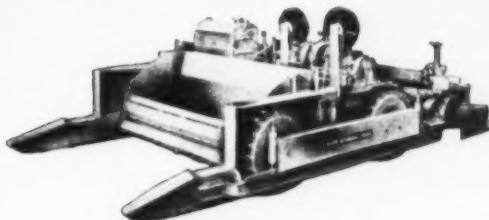
One Machine and One Operator Mixing 12-14 Cu. Ft. Windrow for 36 Ft. Sand-Clay-Gravel Base, 3" Compacted, at Rate of 5' 3" per minute. Note Belt Attachment Re-Windrowing Mixed Material.



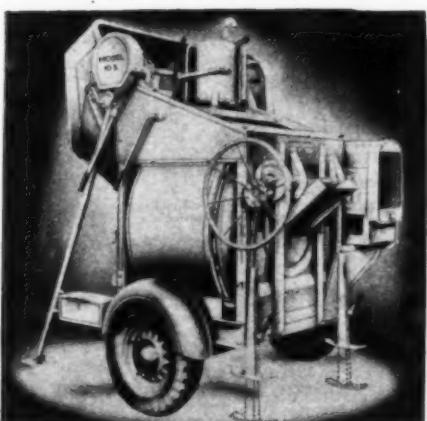
Flows Scrape Subgrade Clean



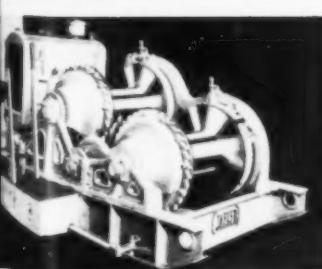
Jaeger Bituminous Paver Lays Stone and All Types Hot or Cold Bituminous, up to 14 Ft. Widths.



THE PAVER THAT LAYS A SMOOTHER SURFACE TOUCHED ONLY BY THE SCREED! No rollers mar or prematurely seal the perfect surface smoothed by the 17 ft. straight edge levelers of the Jaeger Bituminous Paver. All traction on hard subgrade, giving power, speed and capacity greater than most mixing plants. Adapted for quick width changes and laying flush to curb. Heated Screeds an exclusive Jaeger attachment.



1940 TYPE SPEEDLINE END DISCHARGE TRAILER MIXERS—3 1/2" to 145 SIZES. Automotive-Type Transmission running in oil (30% to 40% more efficient, years longer lived) and High Carbon Machined Steel Drum Tracks standard on 55 and larger sizes. Also Tilted other Non-Tilts, to 56S sizes.

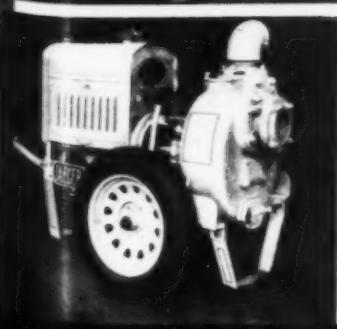


JAEGER'S REVOLUTIONARY IMPROVEMENTS IN HOISTS

include giant expanding friction controlling loads up to 100 H.P. with 4 to 10 lbs. finger pressure, balanced drums on anti-friction bearings, many other advances.

WORLD'S LARGEST SELLING LINE OF CONTRACTORS PUMPS:

Sure Prime Centrifugals 1 1/2" to 10" sizes, for every purpose; Jetting-Dewatering Pumps, Caisson Pumps, Diaphragms, Triplex Road Pumps.



Plan your 1939 jobs with 1939 machines and methods—for high daily production, cost-saving, profit-making. Latest Jaeger catalogs supply important data. Write for copies and prices.

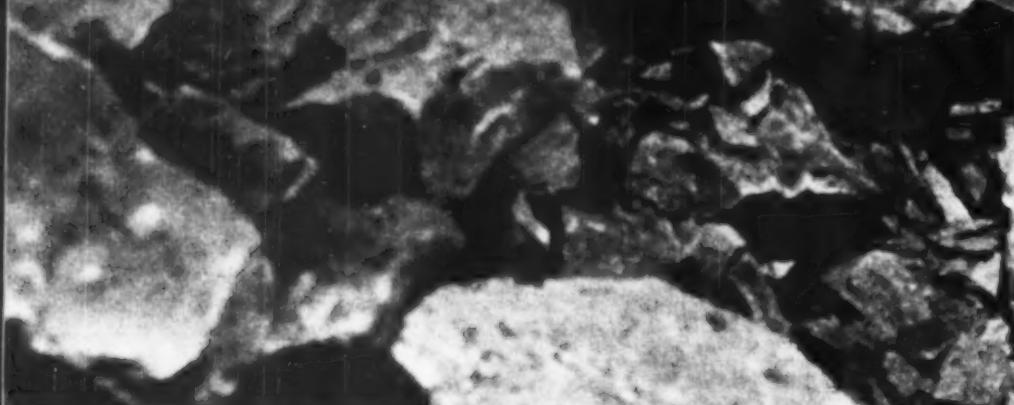
THE JAEGER MACHINE COMPANY

800 Dublin Avenue -- Columbus, Ohio

World's Leading Manufacturer—Concrete Mixers, Truck Mixers, Pumps, Hoists, Road Spreading and Finishing Machines.

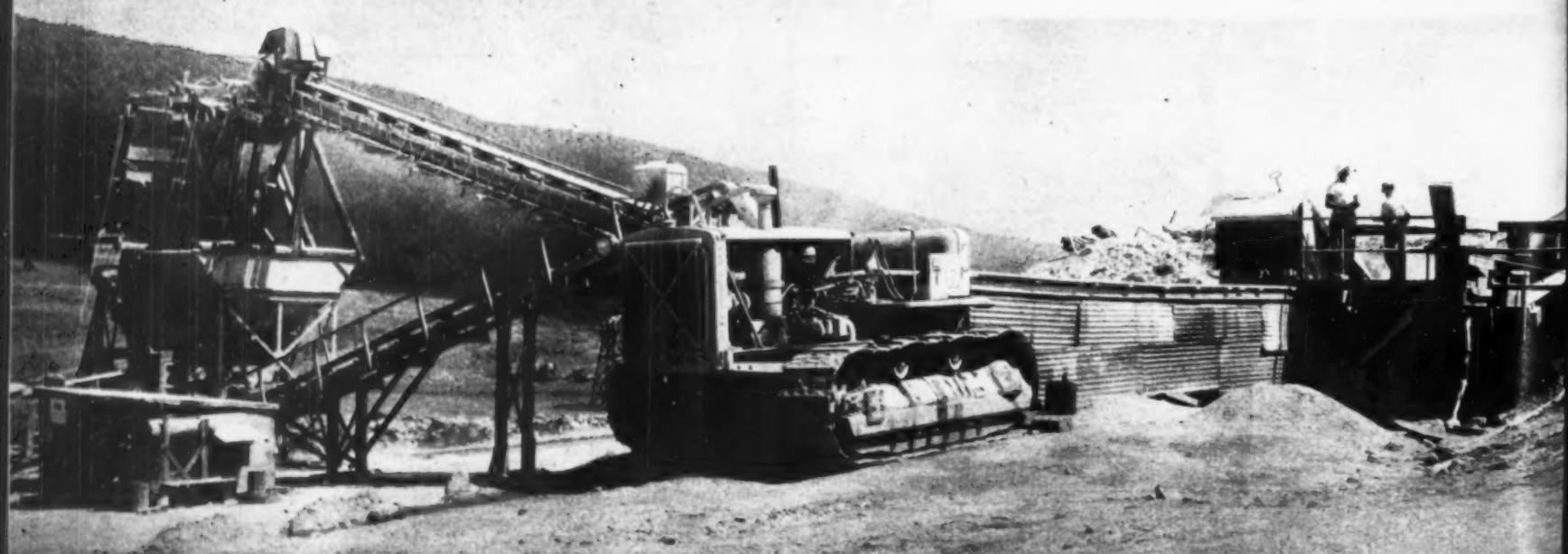
DETROIT PUBLIC LIBRARY

There's



There's real rock, and plenty of it, on this job being handled entirely with "Caterpillar" Diesel Equipment by Edward H. Ellis of Westville, N. J. It's a new reservoir at Dauphin, Pa., a few miles north of Harrisburg. 24-hour operation, here. And these machines are taking it as well as handing it out!

Here's a man who makes the most of his low-cost, dependable "Caterpillar" Diesel Power! This D8 tractor, on the reservoir job near Harrisburg, is working 24 hours a day for Edward H. Ellis—driving a stone-crusher!

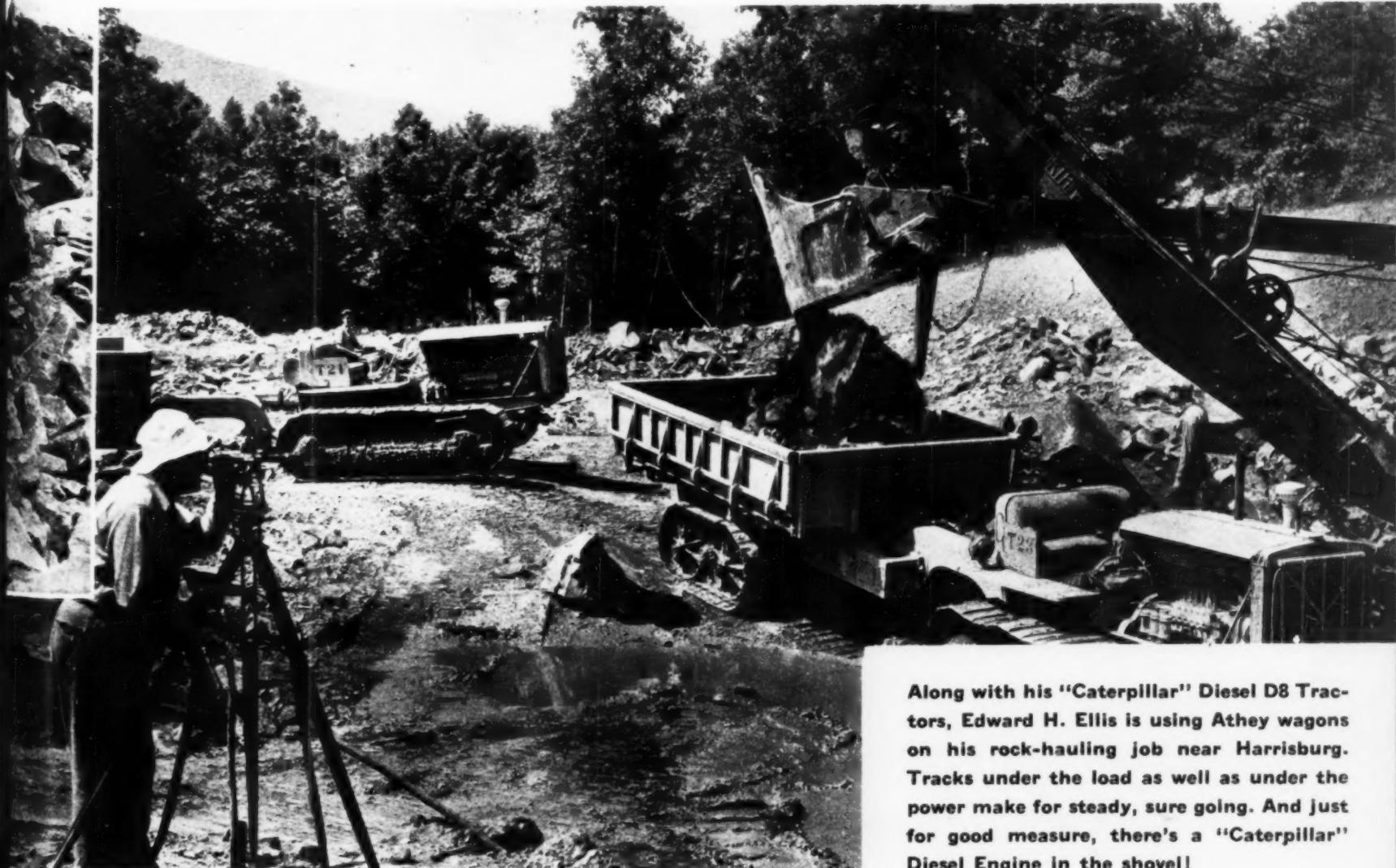


MORE pay-dirt in Rock... WITH "CATERPILLAR" DIESEL EQUIPMENT!

HERE'S the power that can haul *real profit* out of rock! And it does it with a sparing use of low-cost fuel . . . with ruggedness and stamina that *keep down* the time and expense of repairs in spite of tough going . . . and with traction that can maintain a steady hauling-pace with heaping loads over bad spots!

Those are some of the things that make men who have had plenty of experience with rock strong for "Caterpillar" Diesel Equipment. They know it gives them fewer headaches on the job . . . and *more profit* when it's over!

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

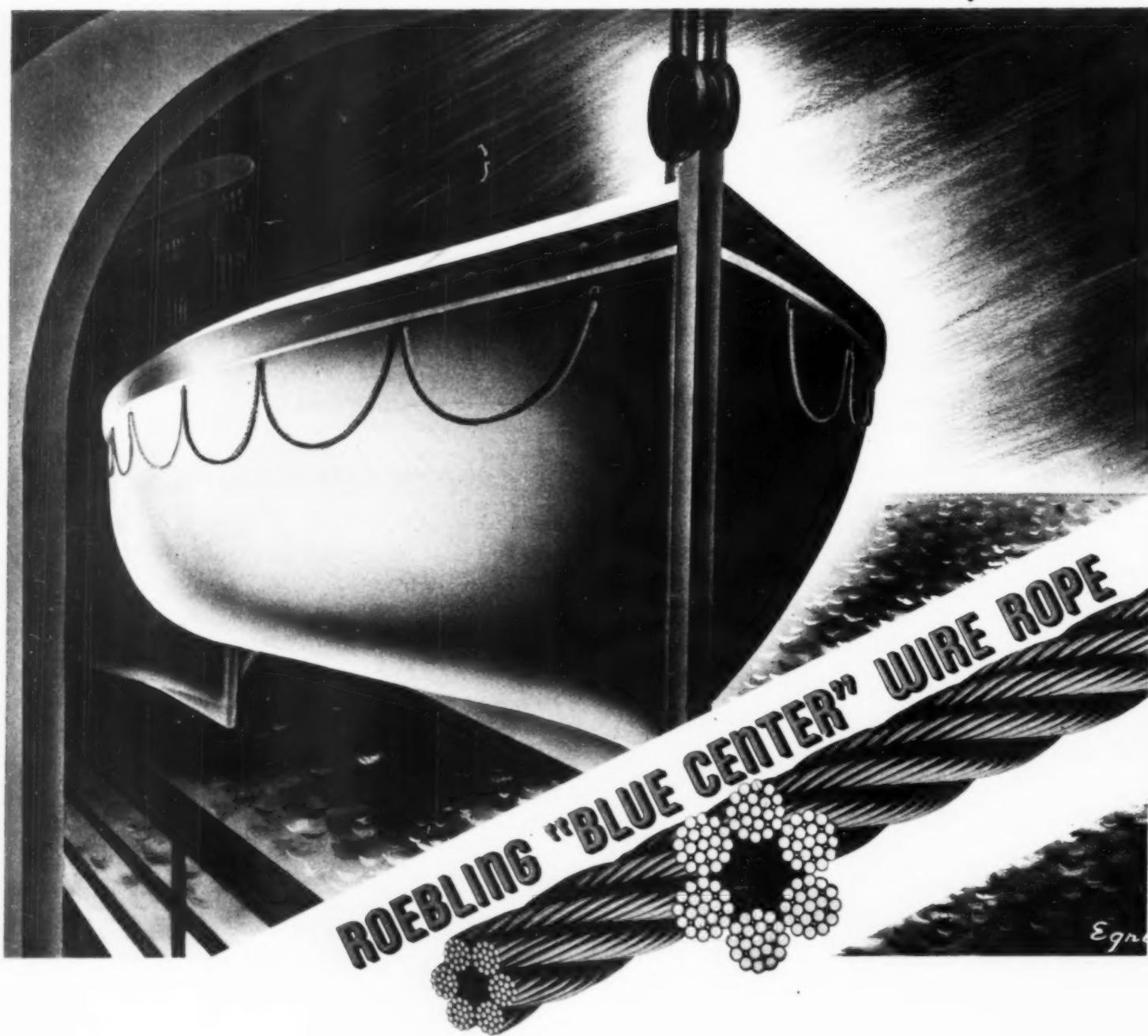


Along with his "Caterpillar" Diesel D8 Tractors, Edward H. Ellis is using Athey wagons on his rock-hauling job near Harrisburg. Tracks under the load as well as under the power make for steady, sure going. And just for good measure, there's a "Caterpillar" Diesel Engine in the shovel!

CATERPILLAR

REG. U.S. PAT. OFF.
DIESEL ENGINES • TRACK-TYPE TRACTORS • ROAD MACHINERY

FOR **EXTRA** SAFETY



A wire rope developed to provide the ultimate in safe, saving service. The finest product of Roebling's unexcelled steel-making, research and rope-fabricating facilities!

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N. J.
BRANCHES IN PRINCIPAL CITIES

STRONGER—Wire of highest strength consistent with ductility and toughness

TOUGHER—Provides maximum resistance against wear, sudden shocks, vibration

SAFER—Unequalled for uniformity of quality

SAVING—Insures lowest general average operating cost

Ask about ROEBLING "BLUE CENTER" WIRE ROPE . . . either standard or preformed

ROAD SHOW AND CONVENTION

K
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G



..... Come to the
1940 Road Show!

Visit Koehring Exhibit to obtain complete information about the many cost-cutting features of Koehring Heavy-Duty Construction Equipment. See the full size machines of the models illustrated here.

KOEHRING COMPANY
MILWAUKEE • WISCONSIN

CHICAGO • JAN. 29 to FEB. 2

EXHIBIT BOOTH
NOS. F-2 AND D-3



This Diesel-powered scraper is one of a fleet used on this job. Operators report freedom from engine trouble with Gulfpride Oil in service.

The bridge shown below carries the Turnpike across a state highway, a railroad, and a stream at New Stanton, Pa.

This dumper was kept in continuous operation, 16 hours per day, on this job with Gulfpride Oil used for motor lubrication and Gulf High Pressure Grease in all pressure fittings.



**"GULF'S HIGHER QUALITY LUBRICANTS
helped us complete these TWO BIG JOBS
on schedule"**

—SAYS GENERAL SUPERINTENDENT ON PENNA. TURNPIKE JOBS

"Our equipment performed at high efficiency—no time lost for repairs"

"WE were particularly pleased with the splendid performance we had from our Diesel engines with Gulfpride Oil in service on these two big Turnpike jobs," says the general superintendent. "We had no stuck rings or other engine troubles which cost time and money."

More and more contractors with heavy work schedules are standardizing on Gulf's higher quality lubricants and getting the benefits of Gulf co-operative engineering



service. They find that the Gulf engineer gives them real service on the job, consulting with operating men and assisting them in maintaining the kind of lubrication which insures freedom from trouble and delays.

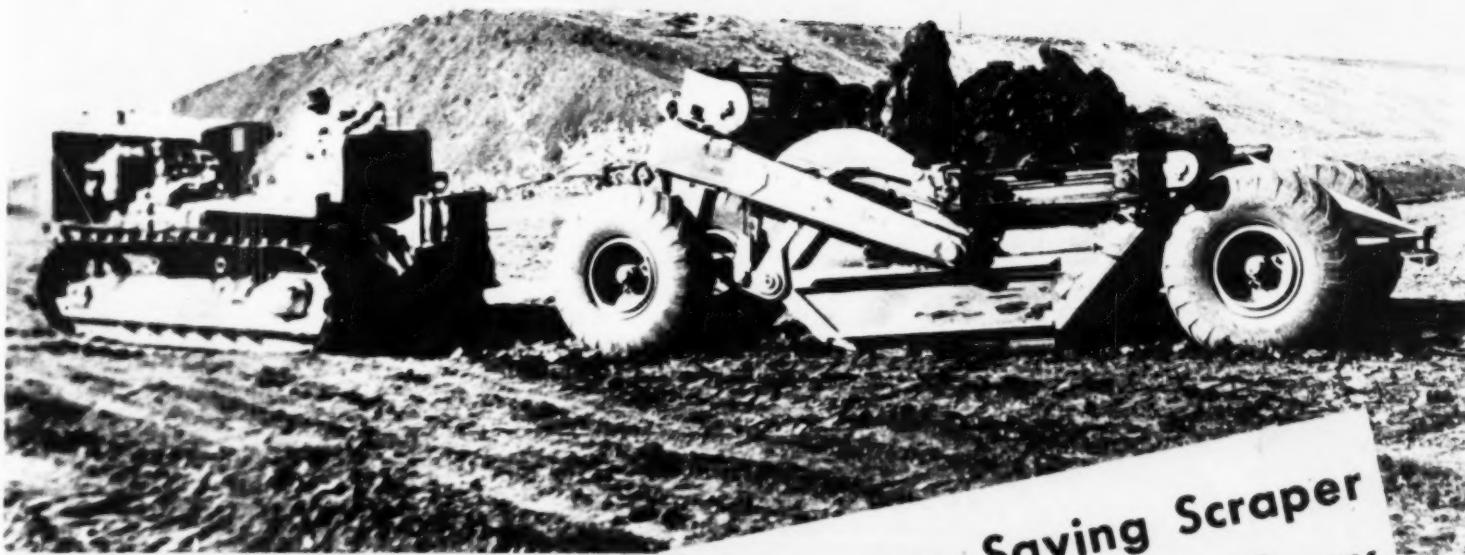
Gulf's higher quality lubricants are quickly available to you through more than 1100 Gulf warehouses in 30 states from Maine to Texas. Write or phone your nearest distributing point today.

GULF OIL CORPORATION • GULF REFINING COMPANY
GULF BUILDING, PITTSBURGH, PA.

Ferguson and Edmondson, nationally known contractors of Pittsburgh, Pa., have completed two important contracts on the Pennsylvania Turnpike, comprising 4.69 miles of grading, bridge building, and drainage work.

Designed to Help You
Make More Profits

LA PLANT-CHOATE Carrimor Scraper



CASH IN ON THESE 4 TIME-SAVING FEATURES

• EASIER LOADING

On jobs in competition with other makes of similar capacity, it proved its ability to load quicker and easier.

• EASIER HAULING

Because of its load distribution and elimination of added dead weight and its close coupled design, this scraper proved its ability to haul equal loads up grades and through soft dumps in one to three gears faster.

• BETTER DUMPING

Because they are the positive ejection type with no obstruction inside the bowl, this scraper will dump sticky materials instantly where others lose minutes trying to dump.

• BETTER SPREADING

This scraper spreads in layers from zero to 15" as desired.

Available in 2 Sizes

13.6 yds. struck.....17 heaped
22 yds. struck.....28 heaped

See This Big Money-Saving Scraper
Displayed at the Road Show

EXTRA VALUE . . . extra capacity . . . increased production at lower cost, that's what this field field-tested LaPlant-Choate Carrimor Scraper means to you! Over 4 years of testing in the field with continual improvements enables this unit to set new standards of perfection and performance.

Easier loading and hauling . . . better dumping and spreading mean added profits for you. But, LaPlant-Choate gives you more than that. Check over these plus features: Lower center of gravity to prevent tipping. Positive acting, higher lifting front apron. Positive push out and pull back on push out gate (no springs). Narrow cutting bit with flared bowl sides to reduce loading resistance. Greater ground clearance for added mobility in soft places.

On the Carrimor, the back of the bowl pan is lower when loading to get material in back of pan easier. A curved push out tail gate helps roll the live load in. Shorter turning radius is better adapted for narrow cuts or narrow fills. Better weight distribution means less tendency to jack knife on steep grades.

Add to these features the Carrimor's ability to stand up under tougher work, and you have a truly superior piece of equipment. And La-Plant-Choate will back up its claims with a demonstration!

Be sure to see this LaPlant-Choate Carrimor Scraper at the Road Show. Write today for free descriptive literature. Designed exclusively for use with "Caterpillar" Track-type Tractors.

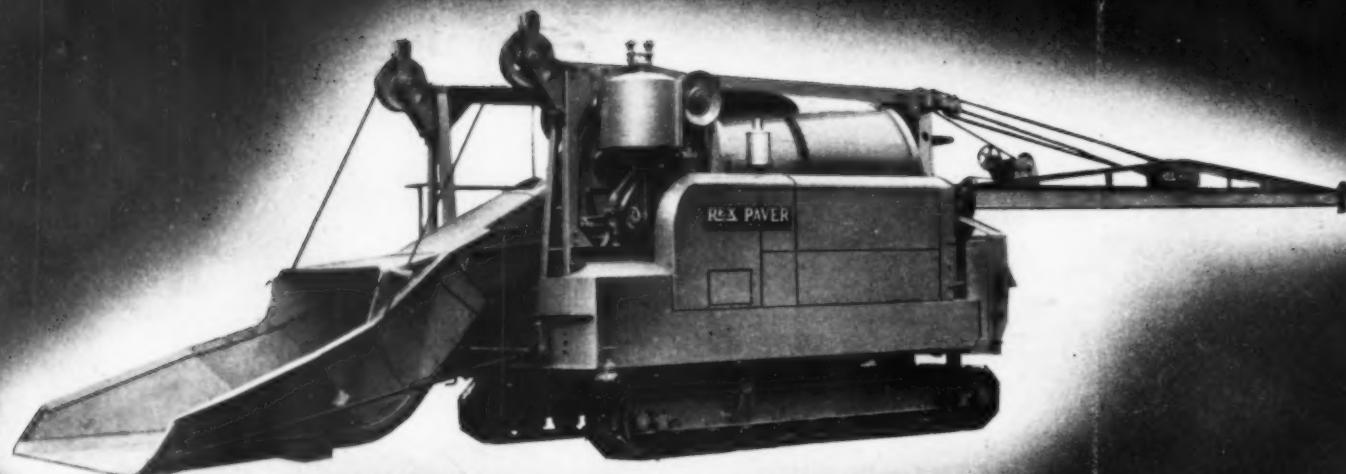
BULLDOZERS
RUBBER WHEELED WAGONS
SNOW PLOWS

LA PLANT-CHOATE
MANUFACTURING CO. Inc.
CEDAR RAPIDS, IOWA.

TRAIL BUILDERS
BRUSH CUTTERS
TAMPING ROLLERS

SEE THEM AT THE ROAD SHOW

1940 REX PAVER

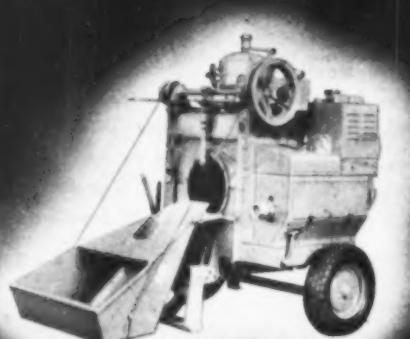


You'll want to USE THEM ON YOUR JOBS

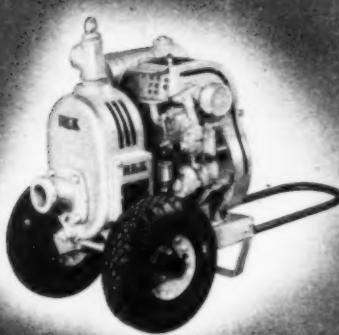
1940 REX 160 PUMPCRETE



1940 REX JOB MIXERS



1940 REX SPEED PRIME PUMPS



SEE the new Rex Paver! Check up on the Rex 160 Pumpcrete! Look over the 1940 line of Rex Job Mixers and Rex Speed Prime Pumps! They'll all be on display at the 1940 A. R. B. A. Road Show in Chicago, Exhibit spaces F-3 and Q-1. See them, talk with the men who make and sell them, and you'll see how true it is that—it's best to buy Rex and be right!

Or, if you cannot make the Road Show trip this year, send for new attractive catalogs on any or all of the Rex equipment that interests you. Address the

CHAIN-BELT COMPANY, 1664 West Bruce St., Milwaukee, Wisconsin

BUY



AND BE RIGHT!

MIXERS • PUMPS • PAVERS • PUMPCRETES • MOTO-MIXERS

"Here's the Favorite for '40"

• Meet the new Lorain-69—a 1½-yd. shovel that will dig anything, anywhere, at the drop of a hat. It has a front end, consisting of an all-welded 21 ft. steel boom and 18 ft. stick, that revels in rock and ups operating ranges to a new high for 1½-yd. machines. It has a stronger, more simplified Center Drive turntable that delivers Diesel power directly for each and every operation in the digging cycle and features such modern improvements as vacuum operation of swing clutches. It's mounted on a heavy, husky, 2-speed Center "Chain" Drive crawler that's a born traveler.

Yes, the Lorain-69 is a great shovel and, being convertible to crane, clamshell, dragline, skimmer or backdigger, it can be used to equal advantage on every type of job. See this modern 1½-yd. machine "in person" at the Chicago Road Show or write for catalog. It's bound to be the favorite for '40!

THE THEW SHOVEL COMPANY
LORAIN, OHIO

SEE
THESE MODERN
MACHINES AND METHODS
AT THE
CHICAGO
ROAD SHOW
JAN. 29-FEB. 2



NEW 1½ YD. **LORAIN** 69

Visit **BLAW-KNOX**

ROAD FINISHING
MACHINES
New Design

ROAD FORMS

BULK CEMENT
PLANTS

BATCHERPLANTS

CENTRAL MIXING
PLANTS

WEIGHING
BATCHERS
FOR AGGREGATES, CEMENT
AND WATER

STEEL STREET
FORMS

CLAMSHELL
BUCKETS

CONCRETE BUCKETS

TRUCK MIXERS
AND AGITATORS

TRUCK MIXER
LOADING PLANTS

READY-MIXED
CONCRETE PLANTS

TAMPING ROLLERS

STEEL FORMS
For General Construction

STEEL BRIDGE
DECKING

STEEL GRATING

STANDARD STEEL
BUILDINGS

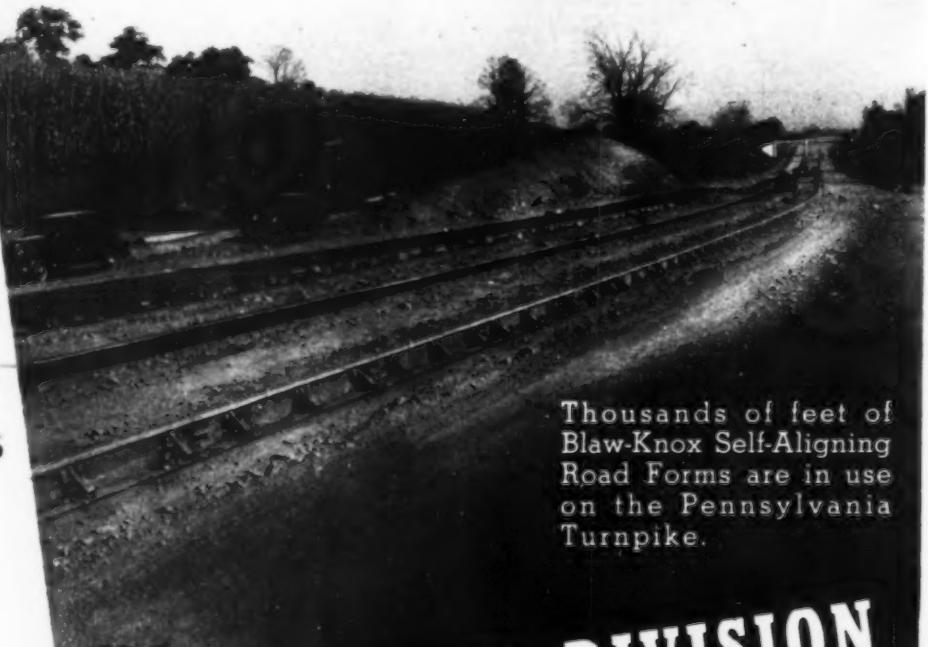


BLAW-KNOX

ON DISPLAY
AT THE ROAD SHOW

Designed for high speed
production and more profit-
able road building oper-
ations. See the modern
methods and equipment
for 1940.

You will be welcomed at Booth L-1



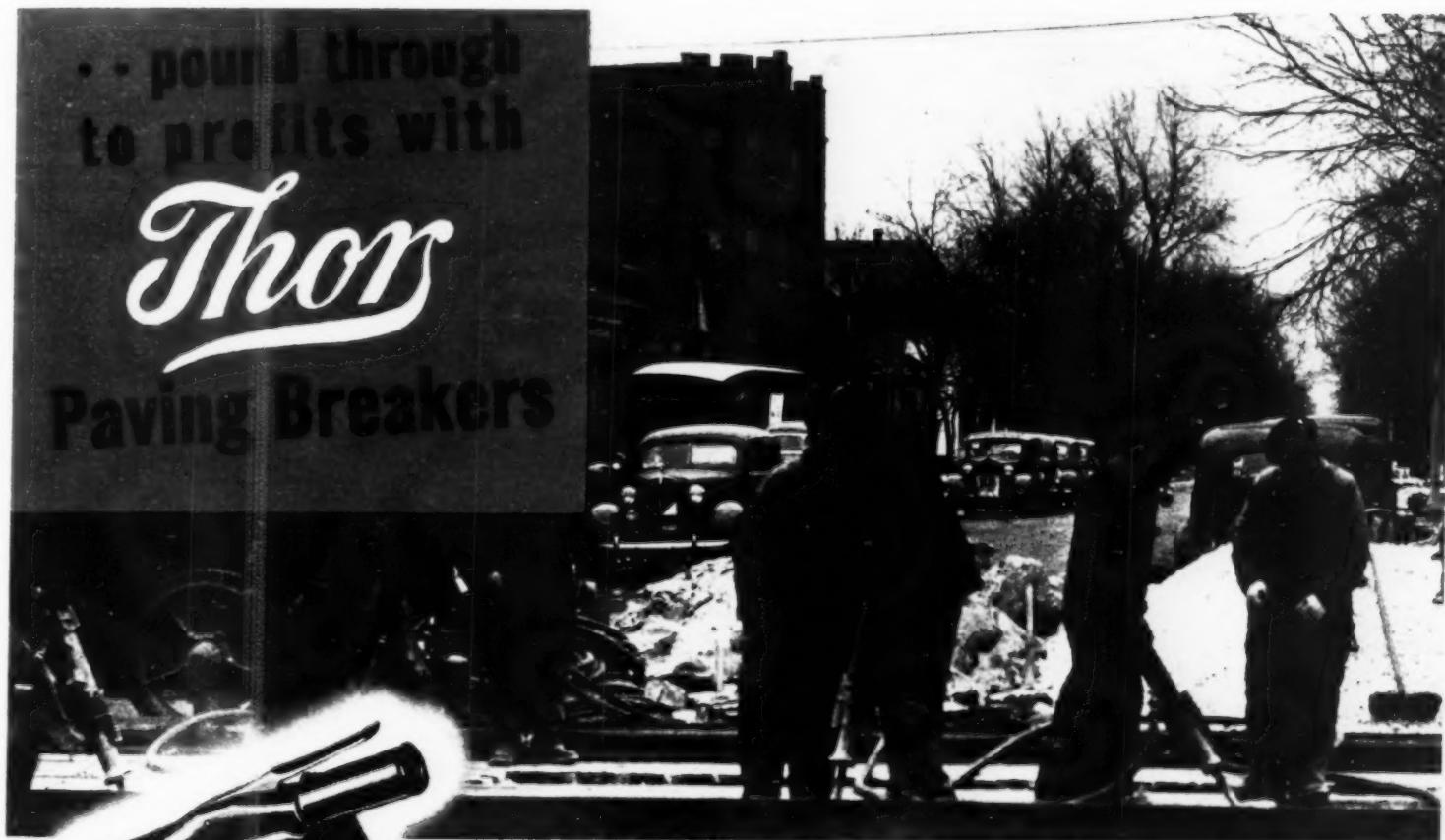
Thousands of feet of
Blaw-Knox Self-Aligning
Road Forms are in use
on the Pennsylvania
Turnpike.

BLAW-KNOX DIVISION

OF BLAW-KNOX CO.

Farmers Bank Bldg. Pittsburgh, Pa.
Offices and Representatives in Principal Cities

When the schedule says "GO" but the job says "SLOW"

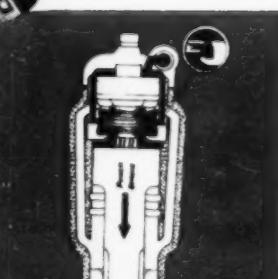


... pound through
to profits with
Thor
Paving Breakers



THE THOR NO. 25 Paving Breaker is a powerful tool for the hardest demolition work. Constructed with a rugged 4-bolt back head and a strong and simple retainer it will pay dividends on the severest service. Other Thor paving breakers are available for light and medium duty work.

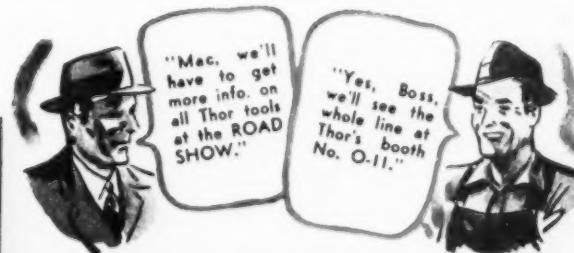
HERE'S WHY Thor air tools have peak power, waste no air. The short travel valve ($\frac{1}{2}$ ") admits only the amount of air required for full power; cuts off early, allowing the air to expand in the cylinder.



Let power-mighty, air-thrifty Thor Tools speed work, make your costs much lower

Present day construction schedules make little provision for interrupted work. Profits depend on taking the job in stride, regardless of conditions . . . and that's what Thor air tools can help you do. These sturdy machines operate with a patented, short-travel valve that precisely controls the air to deliver "every inch of power . . . from every foot of air". For the facts on how and why you get surer, greater performance at lower cost, use the coupon below.

Thor representation is widespread, with branches, dealers and service stations in every principal city.



Independent Pneumatic Tool Co.
278 So. Jefferson St., Chicago, Ill.

Please send catalog on the following Thor tools.

Paving Breakers Rock Drills
 Clay Diggers Tampers

Name

Company

Address

City, State



INDEPENDENT PNEUMATIC TOOL CO.
600 WEST JACKSON BOULEVARD, CHICAGO, ILLINOIS
COCHISE ROCK DRILL MFG. CO. Division 6200 E. Slauson Ave., Los Angeles

Birmingham Boston Buffalo Cleveland Detroit Denver Milwaukee New York
Philadelphia Pittsburgh St. Louis San Francisco Salt Lake City
TOOL MAKERS SINCE 1893

CHEVROLET TRUCKS FOR 1940



Best Haulers . . .
Best Savers . . .
and "BEST SELLERS" in
the entire truck field!

Chevrolet—the nation's largest builder of trucks—now offers its great new line for 1940—56 models on nine wheelbase lengths, all of them selling in the lowest price range!

Extra-powerful Valve-in-Head Engines . . . extra-strong Hypoid Rear Axles . . . extra-sturdy truck units throughout . . . make all these new Chevrolets *gluttons for work*, whether you choose a Sedan Delivery or a Heavy Duty Cab-Over-Engine model.

And Chevrolet's famous six-cylinder economy . . . plus the exceptional dependability and long life of Chevrolet trucks . . . means that all of them are *misers with your money* when it comes to gas, oil and upkeep.

BUY A CHEVROLET— PROFIT EVERY WAY

Only Chevrolet Trucks Bring You
All These Famous Features

New De Luxe Truck Cabs

Chevrolet's Famous
Valve-in-Head Truck Engine

New Hypoid Rear Axle
Extra-Sturdy Truck Frame

New Full-Vision Outlook and
New Hi-Test Safety Plate Glass

Perfected Hydraulic Truck Brakes

Specialized 4-Way Lubrication

New Sealed Beam Headlights
(with separate parking lights)

Full-Floating Rear Axle
(on Heavy Duty models)

(Vacuum-Power Brakes, 2-Speed Rear Axle
optional on Heavy Duty models at extra cost.)



Choose Chevrolet trucks for 1940 and you choose the nation's greatest truck values . . . the trucks that have *proved* their quality leadership by winning volume leadership . . . the best haulers, best savers and "best sellers" in the entire truck field!

CHEVROLET MOTOR DIVISION, General Motors Sales Corporation, DETROIT, MICHIGAN

More than ever, the "THRIFT-CARRIERS FOR THE NATION"

B. R. ACKER CO., Inc., TAKOMA
PARK, MD., CONTRACTOR SAYS:

"We are so well satisfied
with our Model 42 Shovels
we feel . . . other con-
tractors should know the
merits of your equip-
ment. On 60,000 yard
Susquehanna River
Bridge project, Shovel
#3 averaged 126 yds.
per hour. This is really
bailing dirt with a
yard rig."

PURCHASED 3 BAY CITY SHOVELS IN 1939

A BAY CITY will give you
Bigger Performance
at Lower Cost!



NO MATTER what kind of work you are figuring, the *low cost* performance of BAY CITY convertible shovels, cranes, draglines and trench-hoes will return bigger dividends. The experience of more than 25 years of building excavating equipment is reflected in the many outstanding refinements which will quickly be appreciated by the practical construction man. Back of all these improvements are the many advantages of BAY CITY design — BAY CITY endurance — BAY CITY dependability and BAY CITY economy which combine to provide power, speed and easy operation with low maintenance and operating cost. For the complete story about these money-making dirt movers ask for a copy of our 32-page illustrated Catalog H-2.

BAY CITY SHOVELS, Inc., BAY CITY, MICHIGAN

BAY CITY

SHOVELS • CRANES • DRAGLINES • TRENCH-HOES • SKIMMERS

a Faster

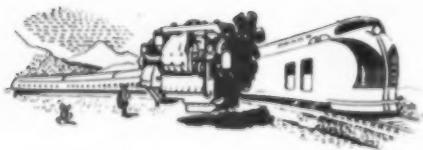
SMOOTH DIESEL

YOU'VE NEVER SEEN ANYTHING LIKE IT. Never before a tractor with 108 Drawbar h.p. . . . and with speeds up to 7 m.p.h. **POWER . . . FLEXIBILITY . . . SPEED** . . . in a combination never before possible in a crawler tractor.

A 2-cycle Diesel engine free of the handicaps of ordinary Diesels . . . field tested under every conceivable soil and climatic condition. On long continuous operations . . . we gave it the works . . . tried to break it down. It met every gruelling test on every job . . . as it will on yours. You'll be as proud of it as we are. Try it . . . see for yourself. Ask your Allis-Chalmers dealer to show you what it can do . . . on your job.

FIVE EXCLUSIVE MONEY-MAKING FEATURES

- 1 **HIGH WORKING SPEEDS**—cut round trip time and lengthen profitable haul distances.
- 2 **POSITIVE-SEAL TRUCK WHEEL ASSEMBLY**—requires lubrication only once in 200 hours.
- 3 **NEW "LONG-WEAR" BRAKES**—greatly reduce time-out for repairs.
- 4 **NEW "LONG-WEAR" STEERING CLUTCHES**—outlast ordinary clutches by several hundred hours.
- 5 **GENERAL MOTORS 2-CYCLE DIESEL ENGINE**—proved by 25,000,000 miles of heavy-duty railroad service.



SIMPLIFIED, POWER-PACKED DIESEL ENGINE—Proved by 25,000,000 miles of service in America's crack streamliners, General Motors 2-cycle Diesel . . . doubles power impulses . . . steps up horsepower per pound of weight . . . gives you oper-

ating simplicity and freedom from repair seldom matched. Smooth-running, it responds to the throttle with flashing pick-up, yet hangs on with the tenacity of steam power.

SPLIT-SECOND ELECTRIC STARTING—Starts right now! No fuss, no bother . . . press the button — it goes to work!

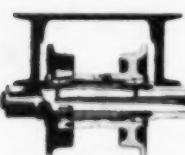


PROVED BY OVER 1,000,000 CU. YDS. OF MUD, SAND AND ROCK—R. W. Briggs,



Pharr, Texas, operated six of these new tractors day and night in the hot Rio Grande Valley, moving 1,059,000 cu. yds. of mud and sand . . . Herman Holmes worked double shifts with five in rock and shale on the Pennsylvania Turnpike at Bedford, Pennsylvania . . . others worked long hours for: Harper Bros. Logging Co., Missoula, Montana; Crossett & Western Lumber Co., Knapa, Oregon; Henry Raemisch, Springfield Corners, Wisconsin; Kiker & Yount, Reidsville, North Carolina; Haddock Bros., Visalia, California. These tractors, in this diversified service, have proved themselves to be the easiest starting, fastest-moving track-type Diesel tractors in the world today.

LUBRICATE TRACKS ONLY ONCE IN 200 HOURS



With the Positive-Seal truck wheel assembly you need lubricate track rollers and idlers **only once in 200 hours**. You save up to 90% on roller and idler lubrication, gain many extra operating hours on greasing time, greatly prolong track life.

LONG-WEAR STEERING CLUTCHES AND BRAKES—In the hardest service . . . night and day operation . . . blistering heat . . . sub-zero temperatures . . . the new LONG-WEAR bimetallic steering clutches and brakes were developed to give you hundreds of hours of extra service. Gruelling tests prove they will greatly outlast ordinary clutches and brakes.

COMPLETELY EQUIPPED—NO EXTRAS TO BUY—Standard equipment includes electric starter and lights, muffler, radiator guard, crankcase guard, front pull hook, bumper, hour-meter, radiator shutters, fenders and heavy truck wheel guards. It's a complete tractor, ready to go to work . . . on your job NOW.

OF HER...MORE POWERFUL DIESEL TRACTOR

ALLIS-CHALMERS
HD-14



Fleet of Gar Wood 15-yard scrapers and A-C Diesel tractors working on the Pennsylvania Turnpike.

ALLIS-CHALMERS *Faster* DIESEL *Power*
TRACTOR DIVISION - MILWAUKEE, U.S.A.

AMERICAN CHAIN

End-Welding for



● True to the traditions which have contributed to American Chain leadership—American Chain engineers tackled the development of a new and far better sling chain—confident the job could be done.

Discarding old-time engineer-

1. END WELDS PROTECTED AGAINST DAMAGE FROM BENDING
2. A PERFECT HINGE—NO UNNATURAL STRAINS
3. ENTIRE LINK NORMALIZED—NO INTERNAL STRAINS
4. UNIFORM MATERIAL—MAXIMUM SAFETY

PERFECTS

Alloy Sling Chains—called "Endweldur"

ing doubts, they found a way for the first time to use a remarkable modern alloy. Severe laboratory and service tests brought forth another vital improvement in that the links of Endweldur Sling Chain are welded at the ends instead of at the sides.

After months of use chain users say this of Endweldur—"4 to 1 longer life in tough service."

Send for this FREE booklet
which pictures and describes Endweldur Sling Chain. Consult us without obligation regarding any chain problem. Address American Chain Division of American Chain & Cable Company, Inc., Bridgeport, Conn.



● also Chains, Chain Fittings and Attachments for Every Purpose . . .

For the vast majority of all industrial chain problems, American Chain supplies the solution—in dependability, safety, low cost first and last.

We are sometimes spoken of as the largest manufacturers of chain in America. If that is our position, it may be attributed to the completeness of the line, quite as well as to the character of American Chain. For the chain you use *must be built for the job you have for it*—if it is to give you lasting satisfaction.

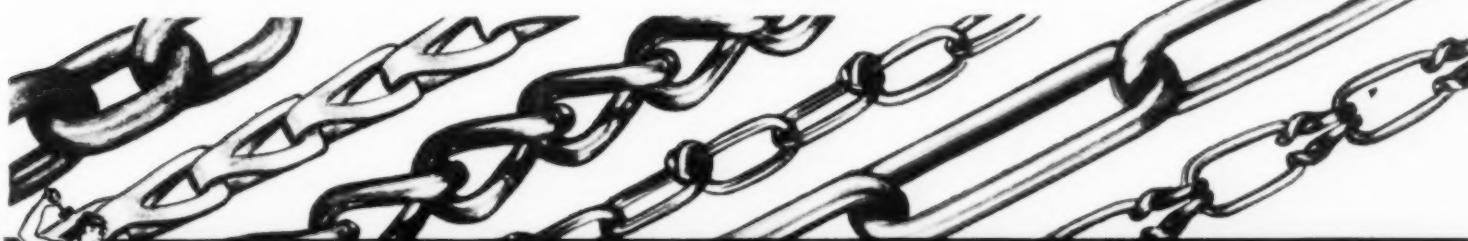
Proper chain fittings and attachments

are of great importance, for they complete the service of the chain. Very often a simple chain accessory will increase the usefulness of the chain and save both money and time. American Chain offers every conceivable type of fitting, designed for convenience and safety, and pre-tested in our laboratories.

Consult the American Chain representative with confidence for he can recommend without bias—backed as he is by quality chains and fittings in endless variety.



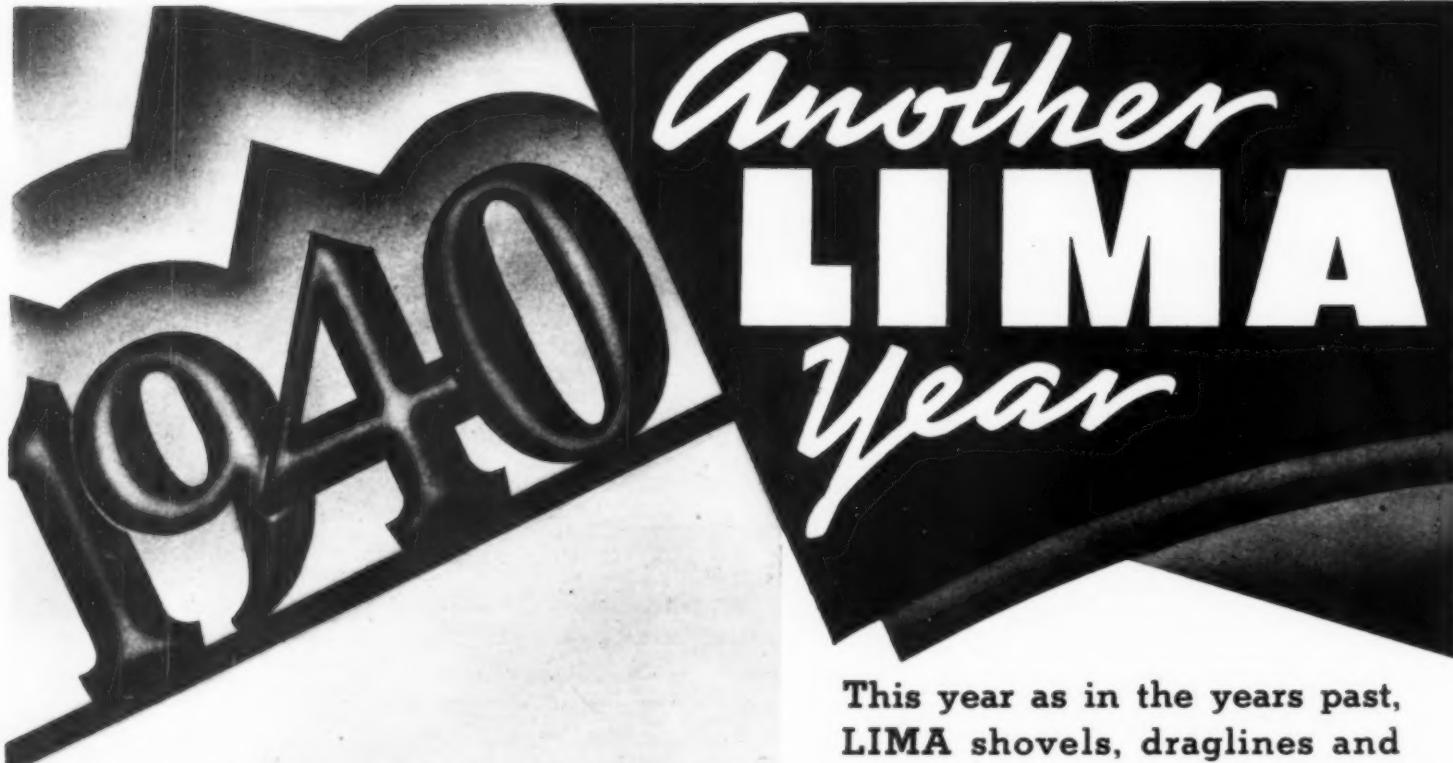
SUMMARIZED: American Chain offers a full line of welded and weldless chain . . . also cotter pins, eye bolts, cold shuts, lap links, repair links, round eyes, malleable castings, grab hooks, slip hooks, sash chain fixtures, screw hook hangers, shackles, S hooks, sling chain hooks, snaps, special attachments, swivels, toggles, utility jacks, welded rings, etc., etc.



AMERICAN CHAIN & CABLE COMPANY, Inc.



AMERICAN CHAIN DIVISION • AMERICAN CABLE DIVISION • ANDREW C. CAMPBELL DIVISION • FORD CHAIN BLOCK DIVISION • HAZARD WIRE ROPE DIVISION • HIGHLAND IRON AND STEEL DIVISION • MANLEY MANUFACTURING DIVISION • OWEN SILENT SPRING COMPANY, INC. • PAGE STEEL AND WIRE DIVISION • READING-PRATT & CADY DIVISION • READING STEEL CASTING DIVISION • WRIGHT MANUFACTURING DIVISION • IN CANADA: DOMINION CHAIN COMPANY, LTD. • IN ENGLAND: BRITISH WIRE PRODUCTS, LTD. • THE PARSONS CHAIN COMPANY, LTD. • *In Business for Your Safety*



This year as in the years past, LIMA shovels, draglines and cranes lead in design, economy and performance. They have been proved dependable and economical on many of the biggest jobs in the country. Whatever kind of material you have to move, you can be certain that LIMA will do the job in the least possible time with more profit for you.

**LIMA LOCOMOTIVE WORKS,
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MODERN
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ASK
ABOUT IT
SEE IT BEFORE BUYING
See it at the
ROAD SHOW
BLAW-KNOX BOOTH
No. L-1

EASY
WIDTH
CHANGE

STROKING
OF SCREEDS
SYNCHRO-
NIZED

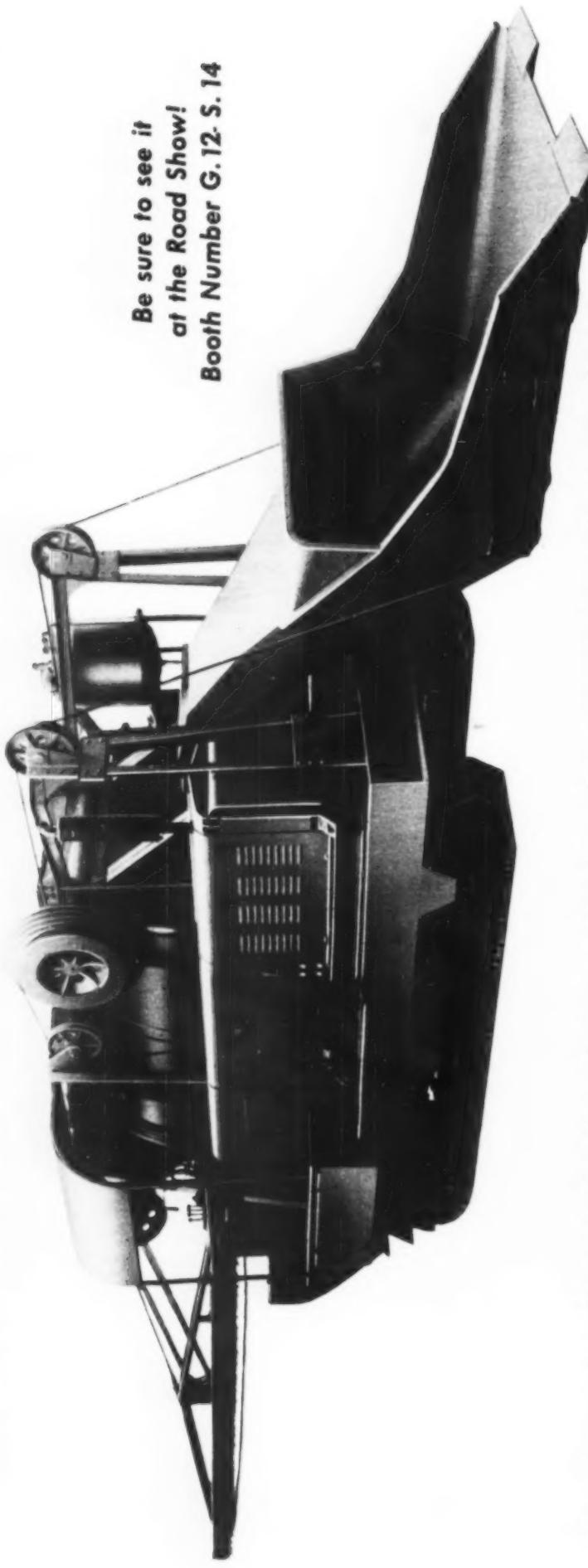
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Ransome's 34-E-DRUM, PAVER



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Booth Number G.12. S. 14*

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- (2) Slow Speed Engine 1250 R.P.M.—Longer Engine Life.
- (3) Hydraulic "Finger Tip" Control—of Boom Swing, Water Valves, Transfer Chute and Discharge Chute with
- (4) Length of Boom 35'.
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- (8) Simplified Design & Construction.

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Tractive Effort
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that enables the tractor to apply full tractive effort to the blade. Bucyrus-Erie Bullgraders and Bulldozers offer you this feature by maintaining the tractor's center of balance. With center of balance maintained, the tractor keeps the *FULL LENGTH* of its crawlers on the ground and uses every ounce of power . . . the full track push . . . to give you better performance on every job. Balanced units are easier on the tractor, too. They relieve overloads on track rollers and on idlers, as well as on other parts of the tractor affected by nose-heaviness. Many other features. For more information on all the features, get in touch with your nearest International

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CONTROLS YOURSELF AND SEE HOW EASY
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On time!"**



**Specify U·S·S for prompt delivery on concrete bars.
Ample stocks on hand.**

TO keep a job up to schedule and get maximum production out of your men and equipment you've got to get your materials on time. That's why it's so important to have a sure, convenient source for concrete reinforcing bars. Specify U·S·S Concrete Reinforcing Bars. There's a U·S·S distributor near you with ample stocks in standard sizes. And he's ready to cut and bend bars to your specifications should you desire it. All U·S·S Concrete Reinforcing Bars

are cleanly and accurately rolled. Bars rolled from *new* billet steel bear the mark of the Concrete Reinforcing Steel Institute. This mark enables you to tell at a glance that you are getting high-quality bars.

Specify U·S·S for your next order of concrete bars. In this way you profit by our facilities for making a high-quality product and take advantage of the prompt service made possible by nationwide location of ample stocks.



CONCRETE REINFORCING BARS

Manufactured by

CARNEGIE-ILLINOIS STEEL CORPORATION, Pittsburgh and Chicago
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United States Steel Export Company, New York



Buy bars that bear this mark—the symbol of the Concrete Reinforcing Institute. It assures you top quality bars—rolled from new billet steel.

UNITED STATES STEEL



...IT'S A ONE

ALL-WHEEL DRIVE and ALL-WHEEL STEER
TEAM UP... to... CLEAN UP
an unequalled number of construction
and maintenance jobs

● One big reason why "99" owners reduce costs per month is because this powerful, versatile machine can be kept at work more hours per day . . . more days per year.

Operating pictures reproduced here show a few of the many EXTRA con-

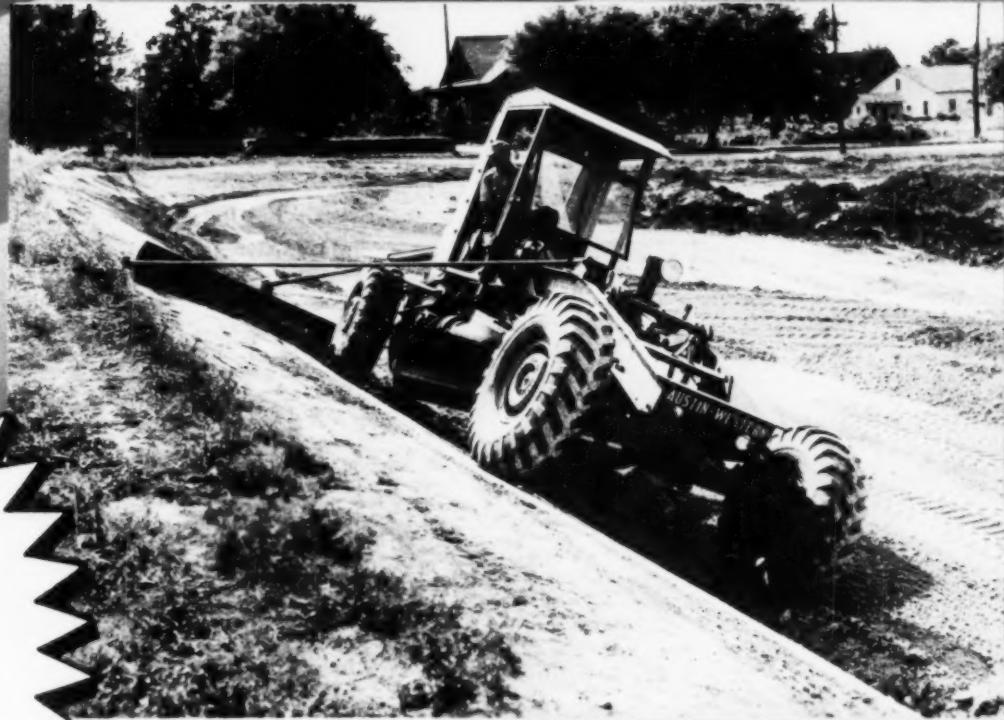
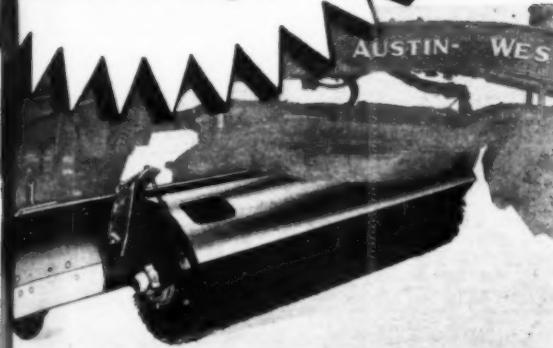
struction and maintenance jobs a "99" takes in stride. They make clear how a "99" enables you to eliminate the need for part-time equipment and, at the same time, do more and better work at new low cost. THE AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Illinois.

AUSTIN-WESTERN

"99"
POWER-GRADER

MACHINE ROAD SHOW

See the "99" and these other A-W Machines at the A. R. B. A. Convention: Roll-A-Plane Patrol Sweeper 4.44 Four-Wheel Drive, 4-Wheel Steer, Pneumatic-Tired Tractor 8-Yard Scraper



Right: "99" Loader: Provides faster and cheaper method of cleaning, ditching and trimming high sod or earth shoulders. Loads excess material directly into trucks.

Left: Rotary Broom: Steel wire; power driven, measure 8 ft. long x 26 in. in diameter. Broom pressure on pavement, direction of sweeping, etc., controlled hydraulically from cab.

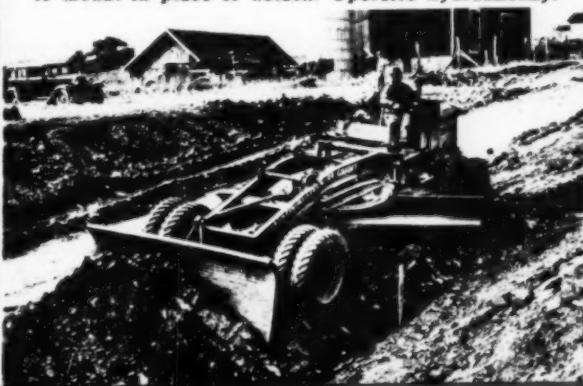
Left: Rear Roller: Built in removable sections, for operation as a 4 or 6-ft. roller with lineal inch pressure of 268 and 185 pounds; measures 30 in. in diameter; operates hydraulically.

Below at Left: Snow Plow: Uses the super-power and traction of 4-wheel drive and steer to remove deeper snow at higher speed.

Below: Bulldozer: Extremely simple, strong and easy to mount in place or detach. Operates hydraulically.



Right: Oval Scarifier: Cuts 46 in. swath. Has eleven tines whose V-formation provides easier penetration, lighter draft and better disintegration. Other scarifiers available.



"99" Finisher: Handles everything from the most difficult bank to the most precise shoulder work. Leaves no wheel marks. Will ditch and slope or grade and slope at the same time. There's no wheel in the windrow, and a single hydraulic valve controls vertical blade adjustments. Material can be pushed in or out, or can be moved the length of both blades.

Rolling down



Bulldozing one of the 22,000-pound iron and concrete tubes into position with an International TracTractor.

International Trucks and Tractors Cut Costs and Save Time on Gigantic Water Conductor Project



The first step on this project—clearing the right-of-way.



Easing the huge tubes into the ditch with a TracTracTor. No cracks, no damage!

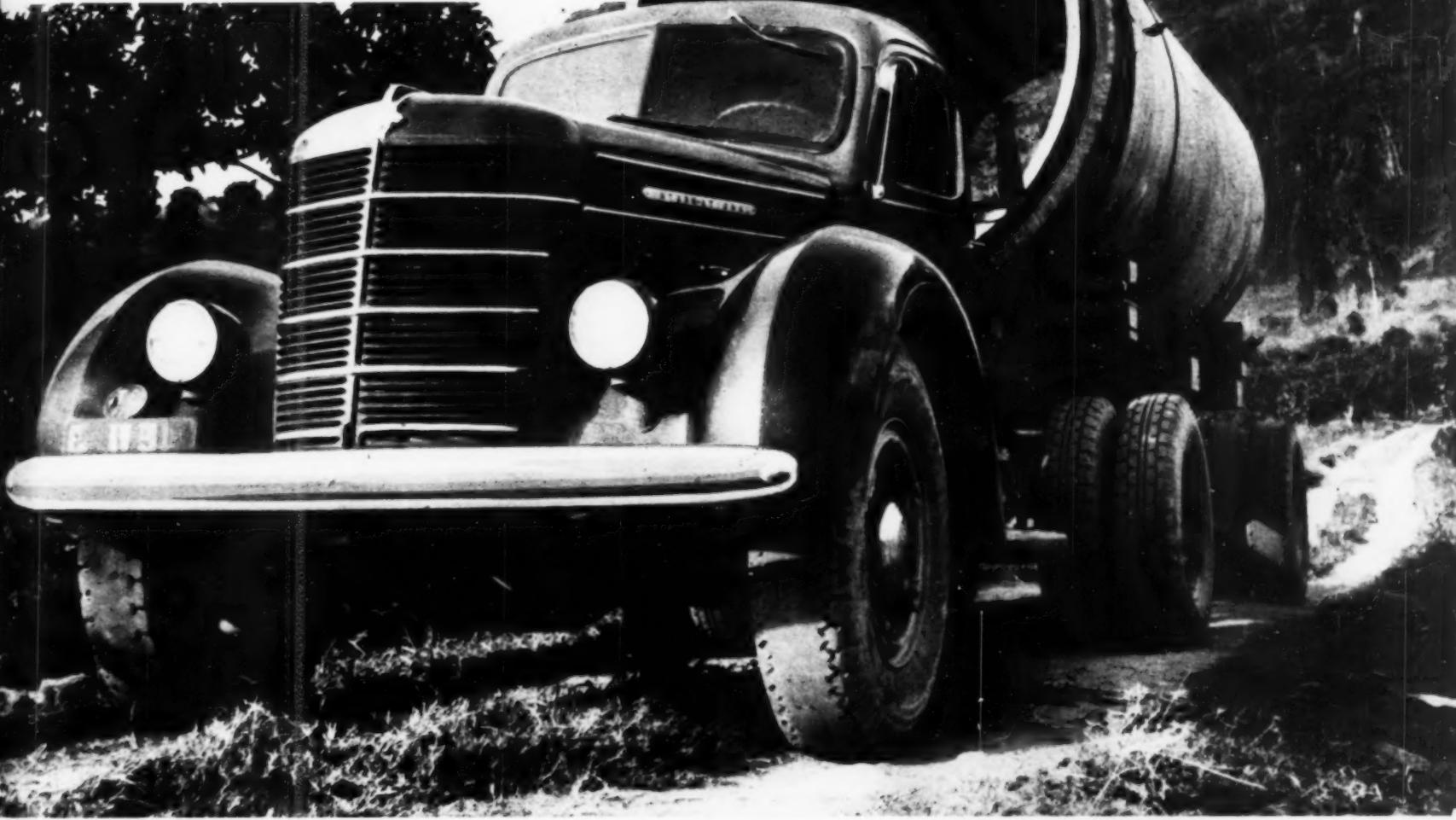
Gay, glamorous Rio de Janeiro moves ahead on its march of progress. A gigantic engineering project is under way to bring crystal-pure water from the mountains to the beautiful capital of Brazil. Sixty miles of twisting, turning, up-hill and down-hill aqueduct construction crosses the colorful Brazilian scene to bring the need and the source together.

Thirteen thousand 22,000-pound iron and concrete tubes will carry the water. Carrying the tubes to their places in the line called for another kind of transportation—modern heavy-duty International Trucks.

The great project demanded the best in engineering skill, business organization, and reliable equipment. Dahne, Conceição & Cia. (Adductora

INTERNATIONAL Industrial Power

to RIO



Hauling a tube into the mountains on an International heavy-duty truck and trailer.

Ribeirão Das Lages S.A.) was awarded the contract. International Trucks and Diesel TracTracTors "rolled down to Rio" and shouldered the job of clearing, grading, and preparing the right-of-way; transporting tubes, materials, and supplies; and easing the heavy tubes into the trench without cracking.

Through the past year the snake-like line has progressed steadily across the valleys and over the hills. Soon,

far-sighted Rio will enjoy the full benefits of its newest utility. Thanks to the ability and dependability of 18 International Trucks and 9 International Diesel TracTracTors, a great city's dream becomes reality!

The world is dotted with such records of International achievement. If you have a hauling or power problem, find out how International can readily solve it. See the nearby branch or dealer.

INTERNATIONAL HARVESTER COMPANY

(Incorporated)

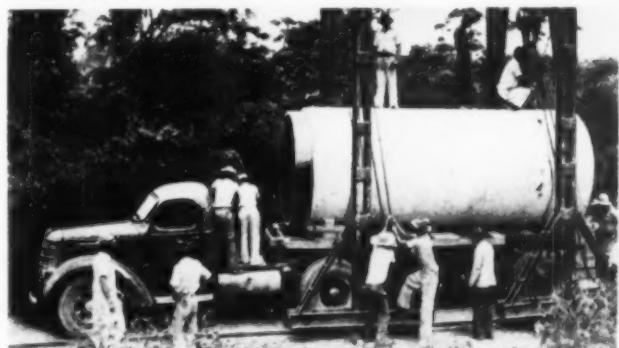
180 North Michigan Avenue

Chicago, Illinois

Sold outside U.S.A. by International Harvester Affiliated Companies and Distributors. Cable Address: Harvester, Chicago.



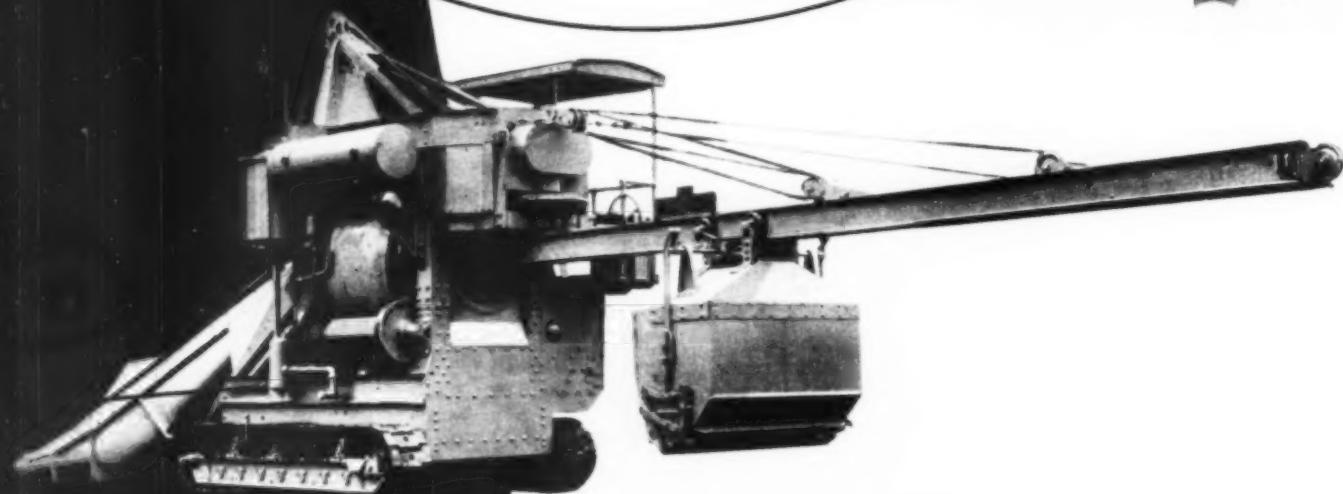
All set to go! A new load moves out every few minutes.



Rapid and careful unloading of tubes along the line.

INTERNATIONAL TRUCKS

At the
ROADSHOW
The right size paver
for every job



MULTIFOOTE
CONCRETE PAVERS

FOR GREATER PROFITS in 1940



MULTIFOOTE — with the Double Cone Drum — a real mixing action — a scouring end to end motion that coats every particle. No building up at the corners. A fast charge and discharge that eliminates wasted seconds in getting the mix on the grade. A wider boom swing end, a long boom that facilitates easier handling from the shoulder. Fast bucket travel and a bucket that really spreads. The no pressure water tank, unaffected by line pressure, accurate regardless of grade—plenty of capacity to care for line changes.

ADNUN BLACK TOP PAVER — Lays any mix, hot or cold, any thickness, any width! Hydraulic controls bring easier, more positive operation. The power cut-off eliminates tag end run outs at intersections. The overlapping Cutter Bar makes positive joints under pressure—with parallel course reducing hand labor back of the machine. A crowding action due to tooth design assures a compact surface without bringing up flats. Continuous Course Correction corrects irregularities with each successive course and makes possible a smoother surface. Four Wheel Drive, power to handle the heaviest truck, simplicity of design and solid, dependable construction combine speedy handling and economy of operation.

THE FOOTE COMPANY, INC., NUNDA, NEW YORK

ADNUN
TRADE MARK REGISTERED

BLACK TOP PAVER



BE SURE TO SEE THESE . . . **Buckeye PROFIT BUILDERS**

AT THE ROAD SHOW
EXHIBIT SPACES
G-14 and S-18

We welcome you and we are sure
you will be interested in our up-
to-the-minute developments in
construction and earth handling
equipment.



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With the new Atlas Catalog, you have at your fingertips complete information about the entire Atlas line of explosives. Products available for each specialized field are grouped for ready reference, with descriptions of the properties of each explosive.

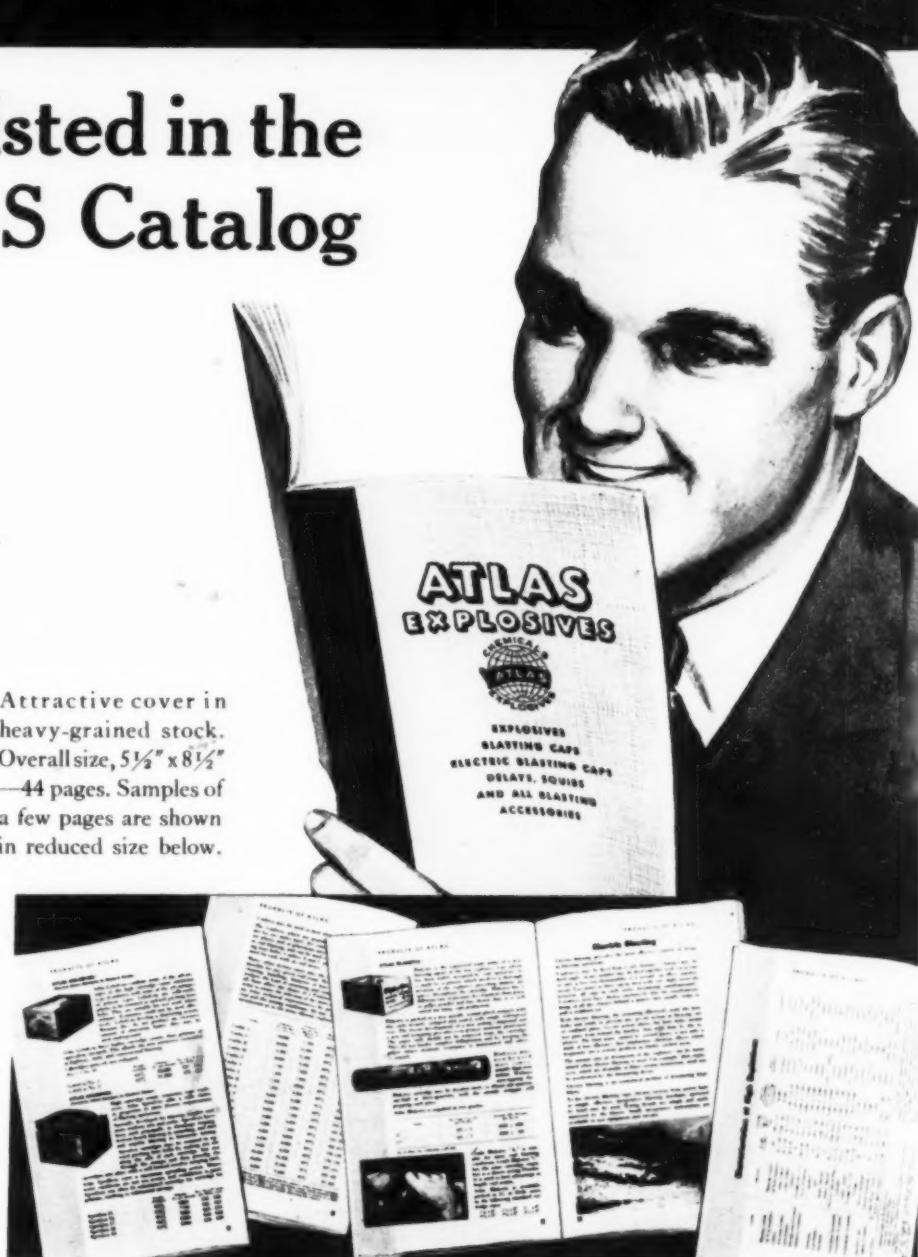
And—in this same book with specifications of Atlas explosives, you will find up-to-date, accurate information on blasting caps, electric blasting caps, delay electric blasting caps, electric igniters, blasting machines, rheostats, galvanometers, fuse,—all necessary blasting accessories.

Not a manual

In order to present complete specifications and descriptions in the handiest possible form, instructions are omitted. The new Atlas Catalog suggests *what* to use for best results (not *how* to use it.)

Purchasing Agents, Superintendents, Blasters, and other persons responsible for safety, economy, and efficiency in blasting operations should have a copy of this new book. Send for your copy, or ask the Atlas representative for one.

Attractive cover in heavy-grained stock. Overall size, 5½" x 8½" — 44 pages. Samples of a few pages are shown in reduced size below.



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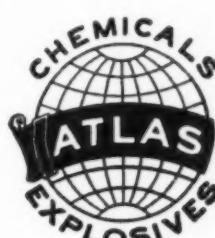
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ATLAS

E X P L O S I V E S



ENGINEERS WIN FIGHT AGAINST TIME

**Bridge repair job
rushed through with the aid of
Atlas High-Early cement!**

SPRING FLOODS washed out an abutment on a Boston & Albany railroad bridge near East Chatham, N. Y. Repairs had to be rushed through. But how could they get this new abutment—with a height above foundation of 28 ft., 17 ft. wide at the base, and 5-10 ft. at the top—ready to take the load in the shortest possible time?

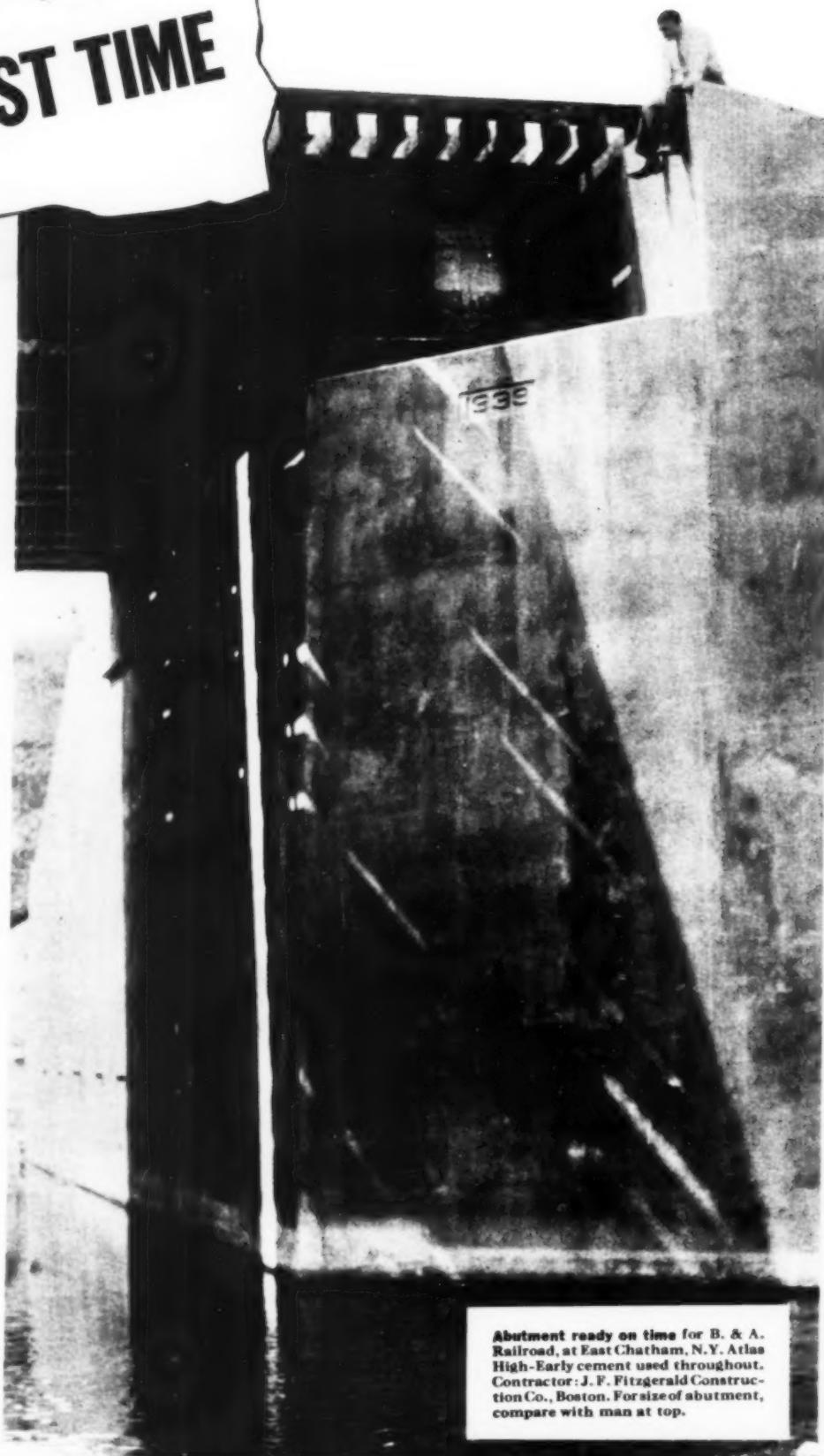
Approximately 650 cu. yds. of Atlas High-Early Strength concrete were placed in one continuous operation in this abutment in two days. Sufficient strength was developed at the end of one week to permit placing of load on the abutment. For Atlas High-Early cement gains strength several times faster than normal portland when used under the same conditions.

Rushing through repair or new construction jobs in record time is only one advantage of using Atlas High-Early cement. Here are others:

Atlas High-Early enables contractors to cut overhead costs and release equipment for other work. (Handy, too, in keeping clear of penalty clauses!) Also, forms may be struck earlier, so fewer sets of forms may be needed. And time required for protection and curing is reduced as much as 60% to 70%—saving time, cost, and promoting winter construction.

Analyze the cost and time factors on your next job. You, too, may be able to reduce costs, increase profits, and save time with Atlas High-Early cement. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), Chrysler Building, N. Y. C.

CM-H-4



Abutment ready on time for B. & A. Railroad, at East Chatham, N.Y. Atlas High-Early cement used throughout. Contractor: J. F. Fitzgerald Construction Co., Boston. For size of abutment, compare with man at top.



Atlas High-Early Cement

A UNIVERSAL ATLAS PRODUCT

Construction Methods

ROBERT K. TOMLIN, Editor

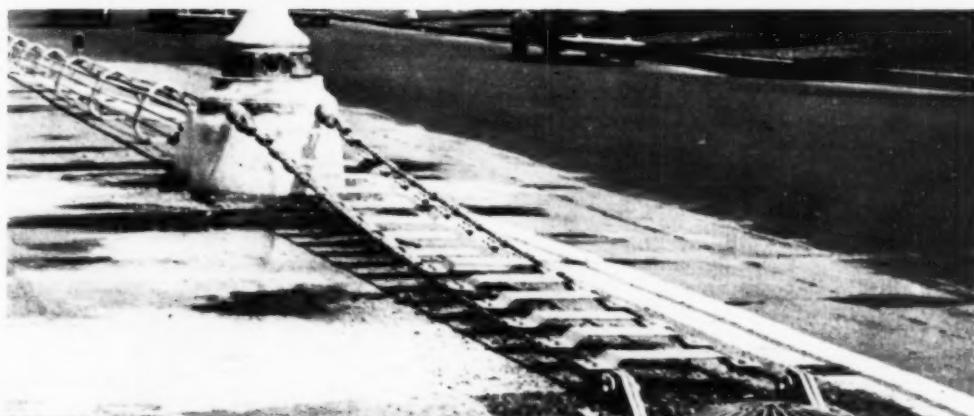
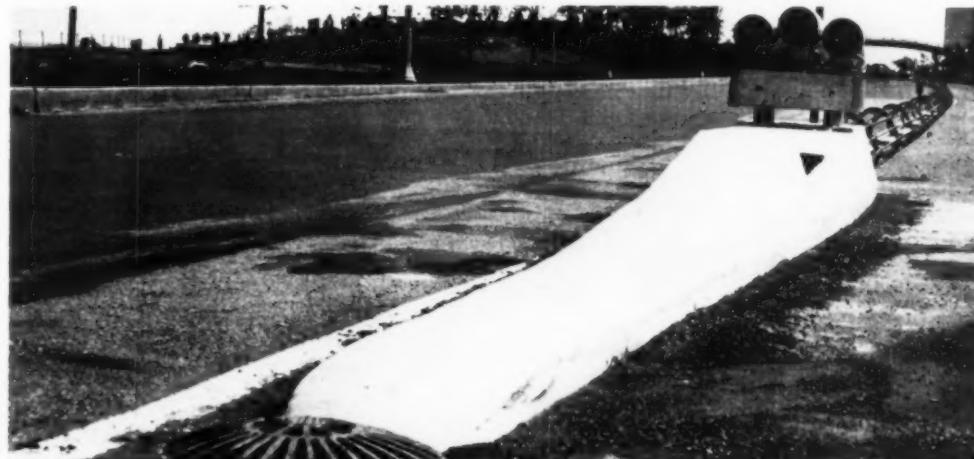
Volume 22

JANUARY, 1940

Number 1

DIVISIONAL FIN Promotes Traffic Safety

THE CHICAGO PARK DISTRICT has completed the experimental construction of a new type of divisional traffic fin on the Outer Drive at 47th St. As described by Otto K. Jelinek, traffic engineer, it features two new types of safety island at the north and south ends of the fin. The north island has approaches made of white cement concrete and is so designed that cars would be deflected from the island proper if struck from an angle



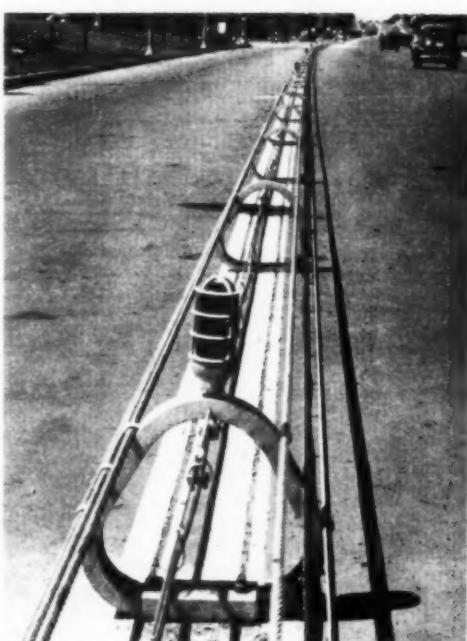
TWO TYPES OF ISLAND at ends of fin include white cement concrete (top) and wire cable with slats.

or off center, or stopped by friction and gravity in case the island approach is straddled. The south island has approaches made of two parallel wire cables inclined from the pavement to the safety island with yellow colored wood boards between these cables. Cars whose drivers are asleep or have their

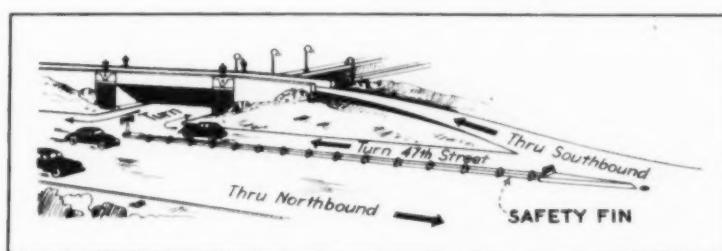
attention diverted would, upon driving on the device, cause the cables to sag, thereby making the wood boards clack upon the pavement sounding a warning to the drivers of their approaching danger.

Stretching between the above de-

(Continued on page 116)



SIX STRANDS OF CABLE (left) form yielding barrier, deflecting cars back into proper channel if struck.





COMBINATION WATER TOWER-TOWN HALL nears completion, from designs of William D. Darby, consulting engineer, at Lake, Wis. Steel frame of 16 legs for central tower supports 1,000,000-gal. elevated steel tank 65 ft. in diameter and four floors of municipal building, inclosed by concrete walls. Ground floor of unique structure consists of four quadrants built integral with tower. Tower 162 ft. high is octagonal in shape with inclosing walls of architectural concrete extending up to dome. General contractor was Oliver W. Wierdsma Co., of Milwaukee, while erection of tank and steel frame was handled by Pittsburgh-Des Moines Steel Co. Edward P. Sheahan served as engineer of construction.

FIRST TUNNEL SECTION HOLED THROUGH on New York City's 85-mi. \$272,000,000 Delaware River aqueduct being driven in rock from 30 shafts to form 19½-ft. diameter concrete-lined bore. View is at point between shafts 21 and 22 near Greenburg, N. Y., marking junction of S. A. Healy and Shea-Kaiser contracts. **FINAL BLAST** (inset) is fired by 11-year old George Gillespie, grandson of Board of Water Supply Commissioner, as **WALTER E. SPEAR** (extreme right) chief engineer, looks on.

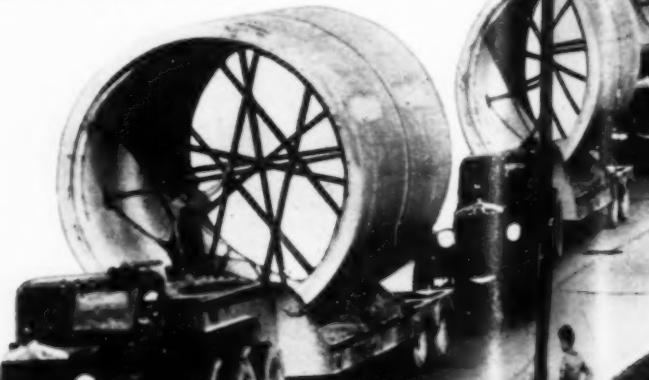


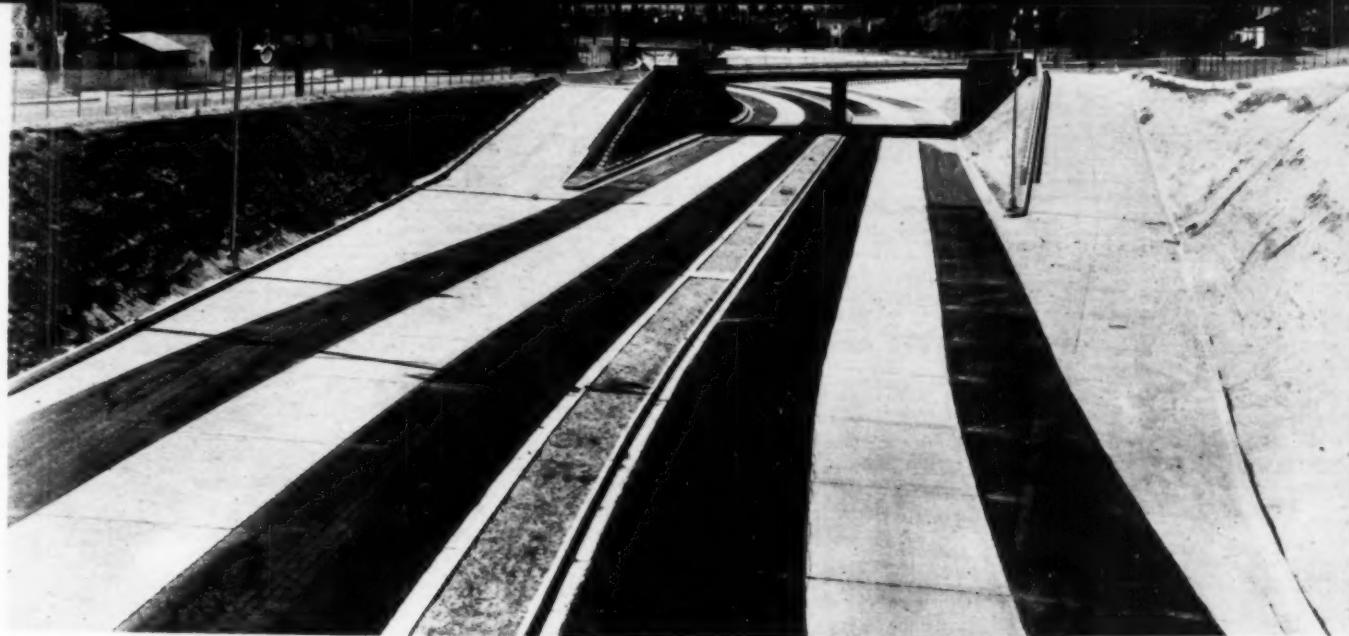
Page 50

SITE OF PINOPOLIS DAM (right), one element of \$40,000,000 Santee-Cooper power development and navigation project in South Carolina, is scene of earth-moving operations by Sammons-Robertson Co., of Huntington, W. Va., subcontractor for Central Engineering Co., of Davenport, Ia., on \$4,172,180 contract for compacted earth fill 75 ft. high, locks and power house. Broad forged-track mountings of Athey wagons, loaded by Lima shovel and hauled by Caterpillar diesel tractors, provides bearing area for heavy loads in soft material

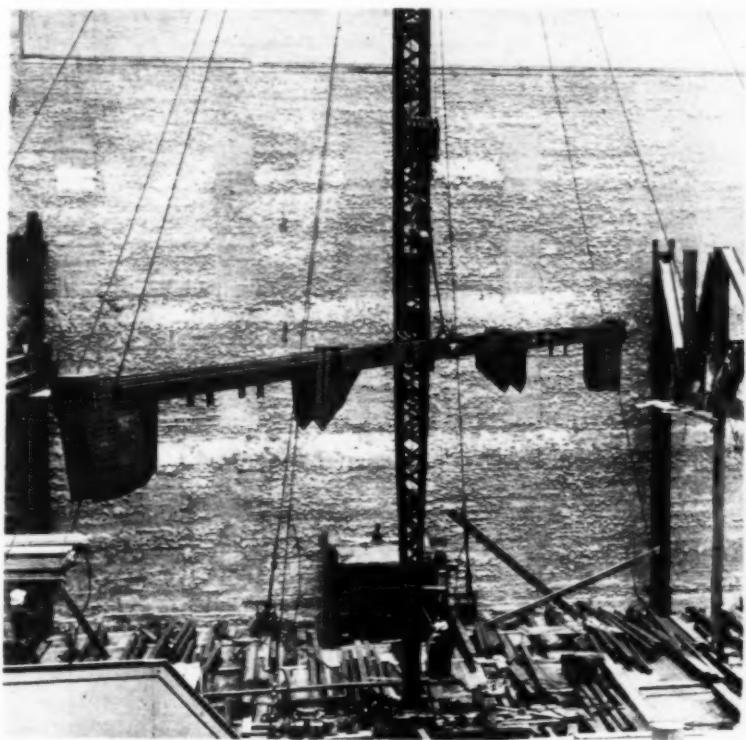


THE BIG PARADE! Weighing 50 tons each, pre-cast sections of Lock Joint concrete pipe 11½ ft. in diameter, 16 ft. long and with a wall thickness of 11 in., are being laid to deliver to Boston's Metropolitan Water District an additional supply of water from Wachusett reservoir. Riding on sixteen Goodyear 14-ply pneumatic tires, heavy-duty Jahn semi-trailers, hauled by Sterling diesel tractor-trucks, deliver heavy loads to points of installation in pipe line trench.





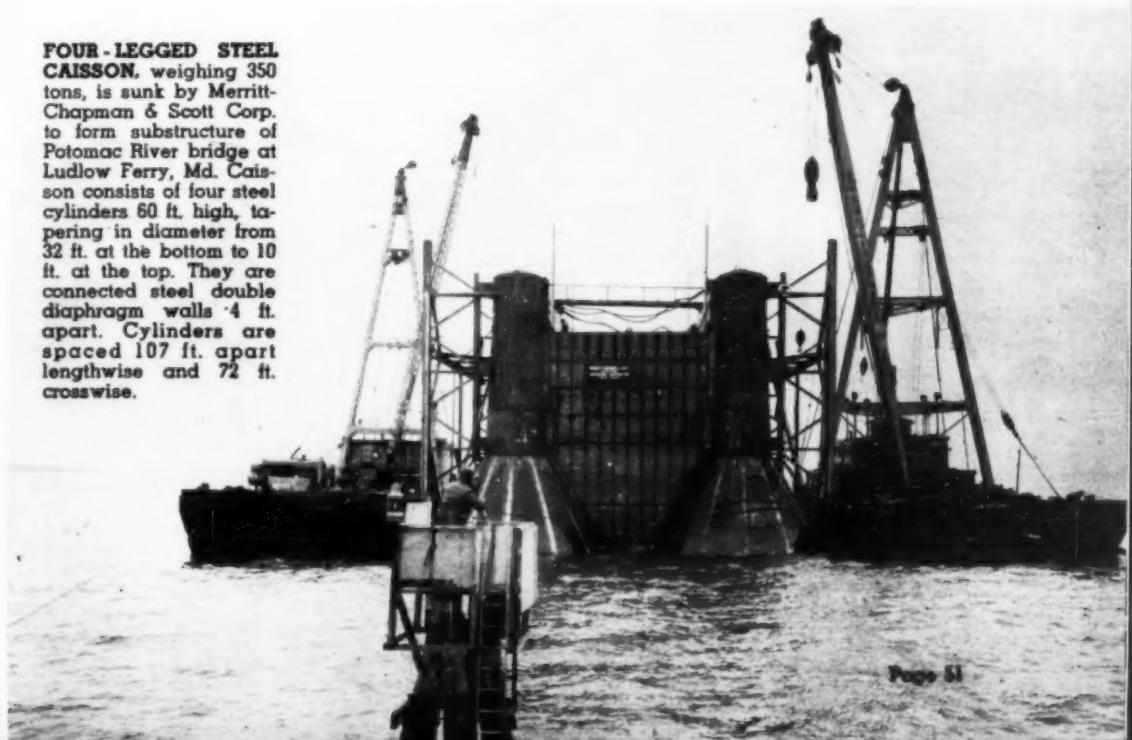
SIX-LANE DIVIDED SUPERHIGHWAY, with parallel service roads and no intersections at grade, forms new Arroyo Seco arterial traffic link of California Division of Highways between Los Angeles and Pasadena. Note central safety island with light reflecting curb, demarcation of traffic lanes by light and dark colored surfaces and widened area at entrance and exit points



QUEENSBIDGE HOUSES, \$15,000,000 project located along East River, New York City, near completion by Cauldwell-Wingate Co. On group of 26 buildings, 6 stories in height, Corbetta Construction Co., subcontractor, placed concrete for floor and roof slabs with 85-ft. boom on crawler crane.

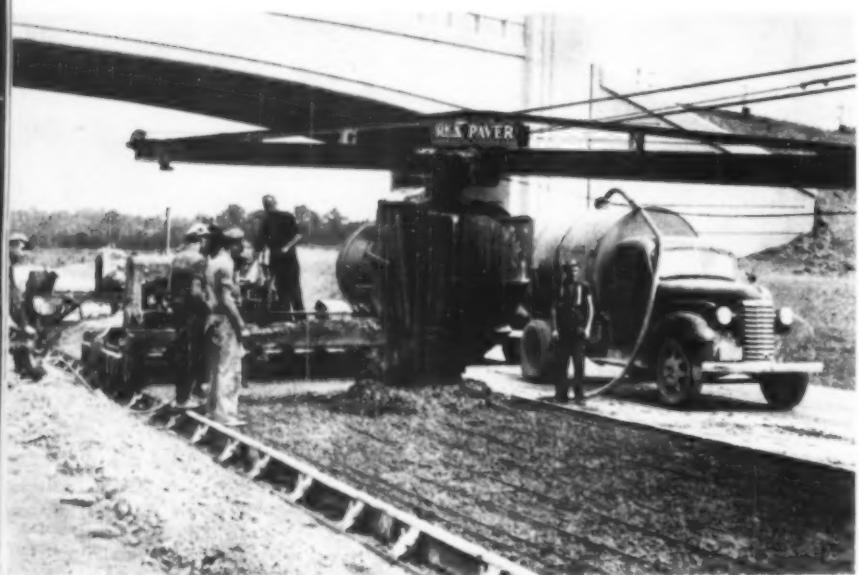
NEW BUILDING FOR TIFFANY & CO. famous Fifth Ave. jewelers of New York City, calls for erection by Bethlehem Steel Co., of 100-ft. steel truss to make possible unobstructed main floor show room 85x100 ft., with ceiling height of 24 ft. New structure at 57th St. and Fifth Ave., planned by Cross & Cross, architects, is being built by Turner Construction Co.; Weiskopf & Pickworth are serving as consulting engineers.

FOUR-LEGGED STEEL CAISSON, weighing 350 tons, is sunk by Merritt-Chapman & Scott Corp. to form substructure of Potomac River bridge at Ludlow Ferry, Md. Caisson consists of four steel cylinders 60 ft. high, tapering in diameter from 32 ft. at the bottom to 10 ft. at the top. They are connected steel double diaphragm walls 4 ft. apart. Cylinders are spaced 107 ft. apart lengthwise and 72 ft. crosswise.





FIRST PAVING CONTRACT on Pennsylvania Turnpike consists of four 12-ft. concrete lanes 9 in. thick completed at rate of 228 lin. ft. per hour by 34E dual-drum paver operating on extremely long batch cycle. Two-batch truck has 38 sec. available time in which to back on to skip, dump 5,353-lb. dry batch and pull ahead clear of skip. Spout on mixer skip facilitates clean charging of mixer drum. Note expansion joint, transverse dowels, and removable plates to form V-shaped key at inner edge of first 12-ft. lane for this roadway.



MIXING WATER is hauled to paver from 15,000-gal. tank at batching plant by two GMC 1,500-gal. tank trucks, at right. Paver is drawing water from first of these trucks. After spreading and striking off concrete to 2 in. below grade, mechanical screw spreader has backed up to permit placement of bar mat reinforcement, now being covered by second lift of concrete deposited from bucket on 35-ft. boom of paver.

MECHANICAL SPREADER (left) running on steel forms is equipped with reversible screw which can be operated in either direction to distribute concrete uniformly across 12-ft. lane. Spring-mounted side plates at both ends of screw prevent concrete spillage. Behind spreader is 1,500-gal. tank truck delivering water to mixer.

Dual-Drum Paver APPROACHES CAPACITY PRODUCTION ON Pennsylvania Turnpike



TO CONSOLIDATE CONCRETE around special steel-dowel expansion joints on 76-ft. centers, workmen use flexible-shaft internal vibrator driven by portable gasoline power plant. Gas-electric finishing machine equipped with two reciprocating screeds makes two or three trips over slab to impart surface finish.



A SMOOTH-RUNNING JOB of Walker Bros., Chambersburg, Pa., averaged 228 lin.ft. per hour of 12-ft. concrete lane 9 in. thick during 77 working days last summer and fall on the Pennsylvania Turnpike's first paving contract, for 10.28 mi. of four-lane divided roadway near the eastern terminus of the 161-mi. express highway between Harrisburg and Pittsburgh. Heading a train of smoothly functioning paving machines, a Rex 34E dual-drum mixer placed concrete on the subgrade at an average rate of 78 cu.yd. per hour. Behind the paver a Jaeger screw spreader distributed the concrete uniformly between the side forms, and a Blaw-Knox gas-electric finisher and Koehring mechanical longitudinal float put the surface finish on the slab. Instead of a pipe line, the contractor used tank trucks to deliver all water for mixing and curing.

Batch Cycle

Specifications required that each batch be mixed a total of 75 sec. in the two compartments of the 34E paver, with no allowance for charging time or transfer time from the first compartment to the second. Penalties were exacted for 5-sec. charging time and 11-sec. transfer time. The transfer chute actually remained open 13 sec. to take care of any contingencies, but 11 sec. was ample to transfer a batch. With addition of the two time penalties, totaling 18 sec., each batch was in the two-compartment drum for 93 sec. between skip elevation and discharge. An accompanying diagram shows how these time requirements result in a batch cycle of 57½ sec.—the minimum possible interval between successive batches on the timelock-controlled schedule.

Based on this minimum batch cycle, the maximum production attainable was 63.6 batches per hour. Actual average production for the entire period of operation from Aug. 17 to Nov. 27 was 56.5 batches per hour, which gives the job an overall efficiency of 89 per cent, reflecting great credit on the management, the workmen and the equipment. Daily production figures appear in an accompanying tabulation.

Except for the first six days, when a slightly smaller batch was used, the batch volume mixed by the 34E paver was 37.4 cu.ft., equal to the mixer's rated capacity plus allowable 10 per cent overload. Average production of 56.5 batches per hour therefore yielded a volume of 78.2 cu.yd., sufficient to complete 234.6 lin.ft. of 12-ft. slab 9 in. deep, without allowance for overrun.

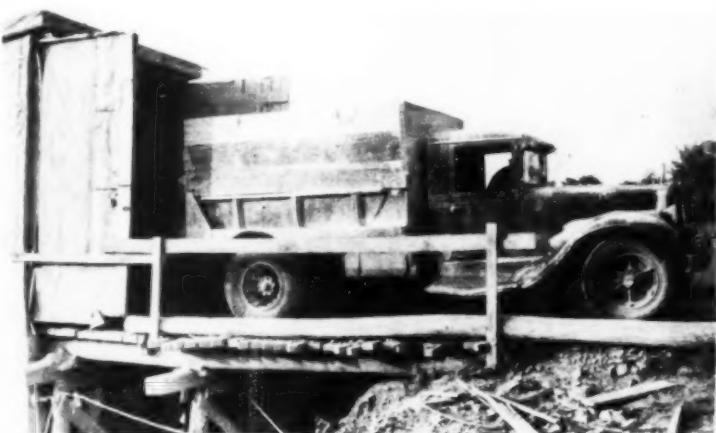
Grade as left by the grading contractor in accordance with plans was about 4 in. high at the centerline and about 2 in. low at the outside form line of each roadway. After shaping the grade for the two roadways with an Austin-Western auto grader and compacting the loose material with a Buffalo-Springfield 10-ton roller, the paving contractor cut form trenches with a Cleveland formgrader, set the steel forms and drove form pins into the compacted subgrade at a great



BATCHING PLANT comprises 275-bbl. cement bin and three-compartment aggregate bins for sand and two sizes of coarse aggregate, with a capacity of 38 to 40 tons in each compartment. Supply trucks dump materials into bins on upper level, and batch trucks receive weighed batches from weighing hoppers on lower level.



DUMP TRUCK on upper level discharges crushed rock into proper bin compartment.

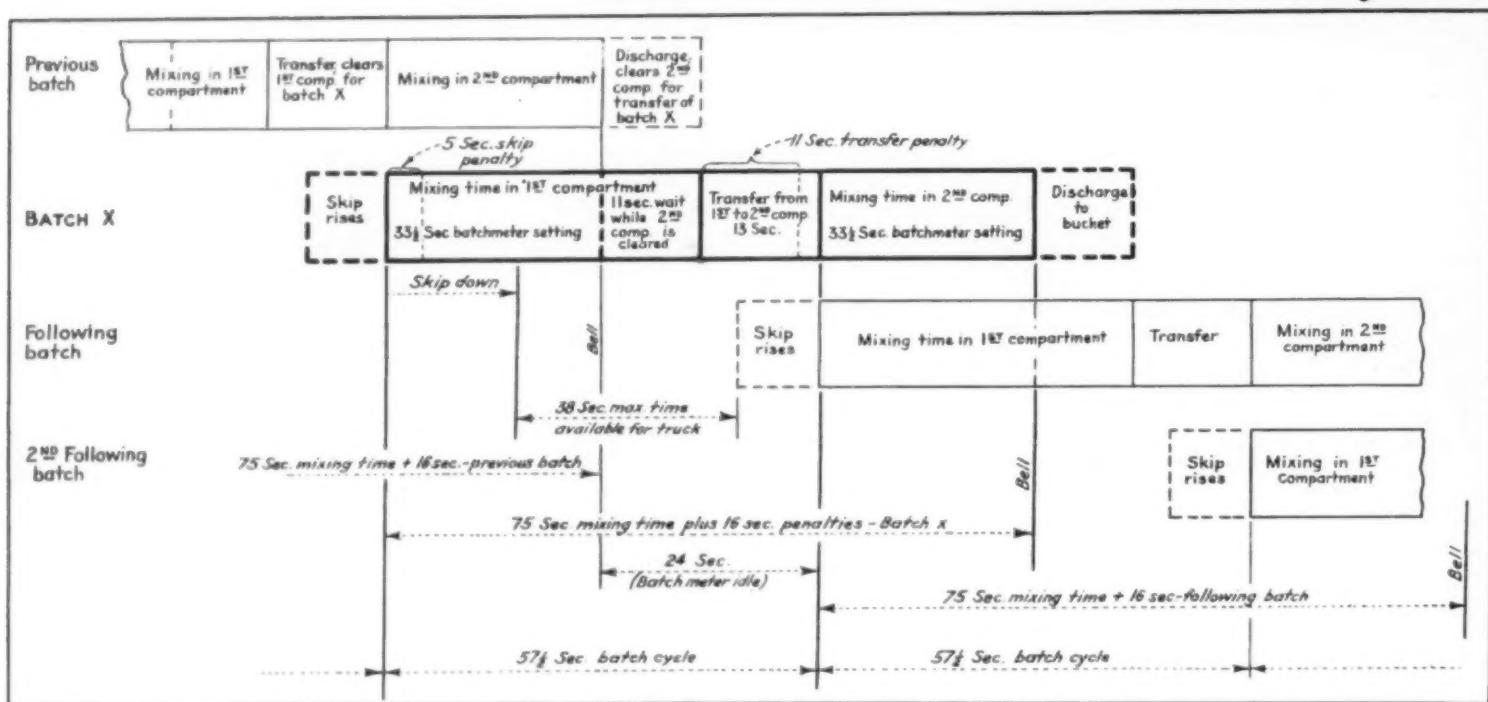


CEMENT TRUCK with special in-closed body backs into house over cement bin to discharge load by end dumping.

BUCKET LOADER (right) puts 7½ to 8 tons of sand into shuttle truck operating between stockpile and sand bins. Materials subcontractor stockpiles about 7,000 tons of fine and coarse aggregates at batching plant for reserve supply.

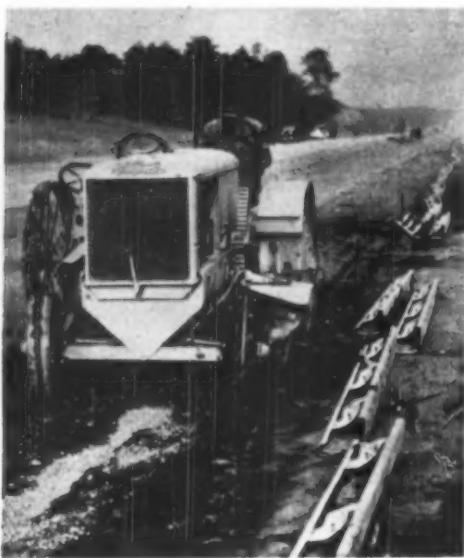


Pennsylvania



DUAL-DRUM PAVER operating on 75-sec. total mixing time in two compartments, with 5-sec. penalty for charging and 11-sec. penalty for transfer from first to second compartment, has theoretical cycle of 57 1/2 sec. between successive batches, making it theoretically possible to produce 63.6 batches

per hour at 100 per cent efficiency. Manufacturers of dual-drum pavers reasonably contend that transfer movement is part of mixing action and that transfer time ought to be included in mixing time.



FORM TRENCH is cut to line and grade by form-grading machine.

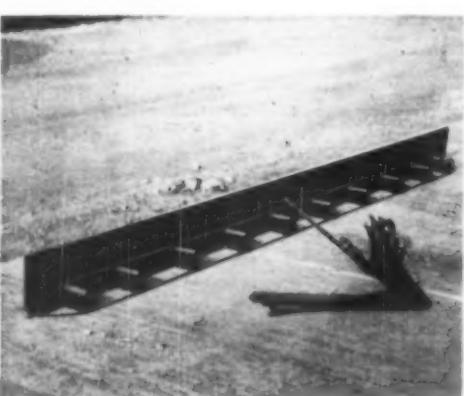


PNEUMATIC HAMMER drives form pins at considerable saving in labor.

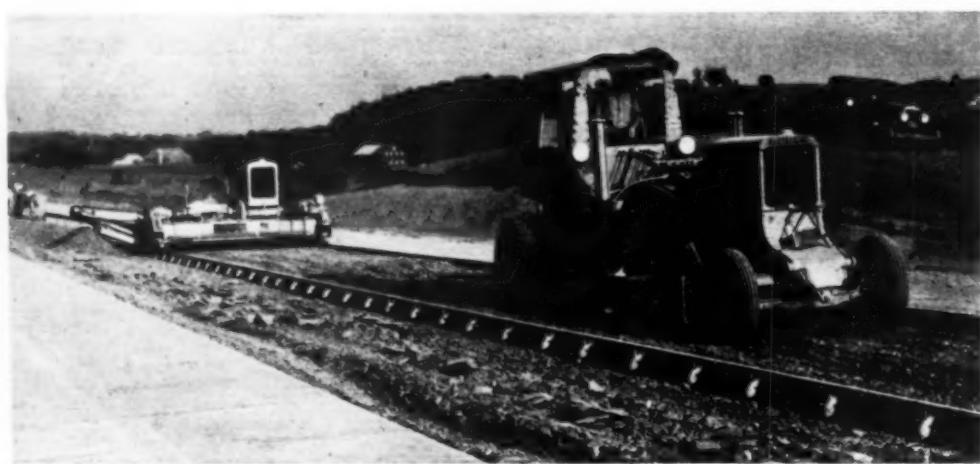
saving in labor with an Ingersoll-Rand jackhammer, air-powered by a truck-mounted compressor. To avoid any delays which might be caused by lack of forms ahead of the mixer, the contractor put 12,200 lin.ft. of Heltzel 9-in. steel forms on the job. A Lakewood mechanical form tamper packed earth fill under the bottom flanges of the steel rail forms. Running on the forms, a Flynn subgrader cut the subgrade to accurate profile. A 5-ton Huber roller completed surface compaction of the subgrade behind the self-propelled subgrading machine, and a Huber motor grader scarified high spots in cuts ahead of the subgrader.

Batching Plants—Uninterrupted flow of batched materials to the paver was

(Continued on page 108)



PREFABRICATED EXPANSION JOINT ASSEMBLIES are shipped to job ready for installation on subgrade. Lying on slab in front of this expansion joint assembly is collection of transverse dowel bars bent for insertion in removable plates of first lane.



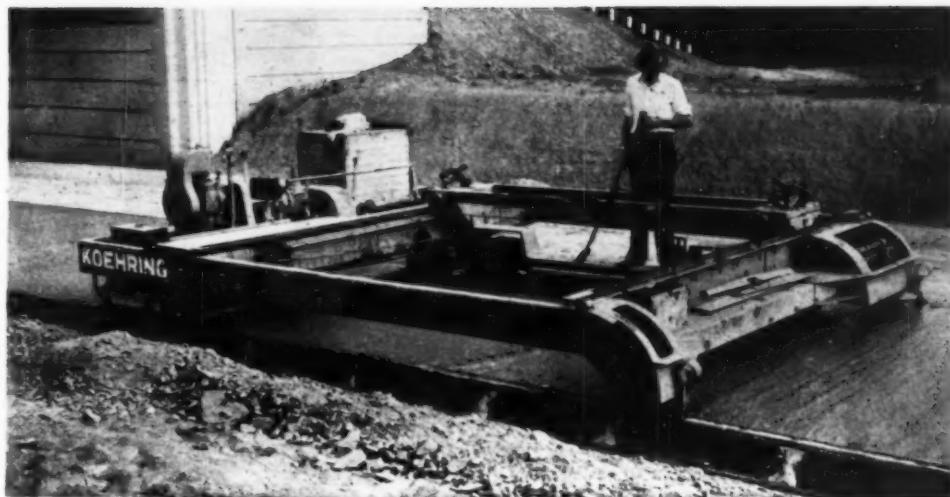
FOLLOWING SCARIFYING by auto grader at high spots in cuts, self-propelled subgrading machine traveling on road forms excavates subgrade to desired profile and delivers spoil by conveyor to pile outside forms.

Turnpike (continued)

DAILY OUTPUT 34E DUAL-DRUM PAVER PENNSYLVANIA TURNPIKE

Walker Bros., Contractors

DATE	NET OP. TIME	LIN. FT. PLACED	NO. OF BATCHES
	Hr. Min.		
August			
17	4 05	686.0	174
18	3 50	511.5	140
21	5 50	919.5	247
22	8 10	1250.3	335
23	12 45	2569.5	683
24	5 20	996.0	263
25	13 55	2869.5	704
26	5 40	1259.5	305
28	12 00	2680.0	662
29	14 30	3098.5	769
30	13 12	2576.2	664
31	7 05	1536.5	384
September			
1	12 06	2559.5	641
2	6 25	1375.5	342
4	6 47	1504.5	379
5	9 10	2003.0	507
6	20 00	3862.5	964
7	22 35	3399.5	844
8	14 10	2322.5	582
9	11 20	2677.0	660
11	14 37	3633.5	901
12	9 37	2133.0	536
14	7 34	1764.0	440
15	15 23	3742.0	939
16	10 32	2443.0	607
18	7 20	1685.0	416
19	14 00	3371.5	828
20	14 31	3508.5	867
21	11 31	2753.0	689
22	6 56	1672.0	413
23	8 55	2096.0	516
25	15 04	3768.0	925
26	13 33	3281.0	816
27	5 15	1215.0	299
28	15 38	3874.0	960
29	5 20	1261.0	318
October			
4	12 01	2634.0	671
5	10 59	2670.0	664
6	15 17	3794.0	941
7	15 05	3942.0	965
8	9 55	2359.5	576
9	14 57	3767.5	928
10	15 24	3821.5	943
11	15 35	3825.5	942
12	18 31	4374.5	1076
15	14 25	3489.5	860
16	11 15	2675.0	659
17	12 47	3041.5	753
18	11 10	2724.5	672
19	13 37	3402.5	839
20	11 56	2945.0	718
23	14 54	3566.0	873
24	13 00	3205.0	786
25	9 24	2284.0	569
26	16 43	4056.0	1003
27	4 00	835.0	211
30	9 08	2112.0	529
November			
2	10 55	2426.0	612
3	11 23	2644.0	657
4	9 35	2262.0	561
6	8 30	1975.0	492
7	10 28	2406.0	593
8	8 20	2009.5	495
9	9 25	2328.0	568
10	10 40	2437.0	597
11	8 35	1845.0	453
12	11 15	2542.0	624
13	10 55	2537.0	616
14	12 45	2996.0	729
15	10 05	2358.0	575
16	13 27	3175.0	778
20	9 35	2356.0	574
21	10 50	2538.0	622
22	10 20	2515.0	615
23	12 30	2940.0	722
24	7 00	1575.0	388
27	4 30	761.5	187
TOTAL	855	43	195,008.0
			48,355



BEHIND FINISHING MACHINE. mechanical longitudinal float takes out any remaining surface irregularities which might detract from smooth riding qualities of pavement.



BURLAP COVER (right) on concrete is kept wet for 3 days by four 1,000-gal. tank trucks equipped with side sprinkling bars.



UNWRAPPED FROM WOODEN BAR (mounted on short-leg horses for convenience) burlap drag (right) is used to produce non-glare, non-skid surface texture on freshly finished slab.

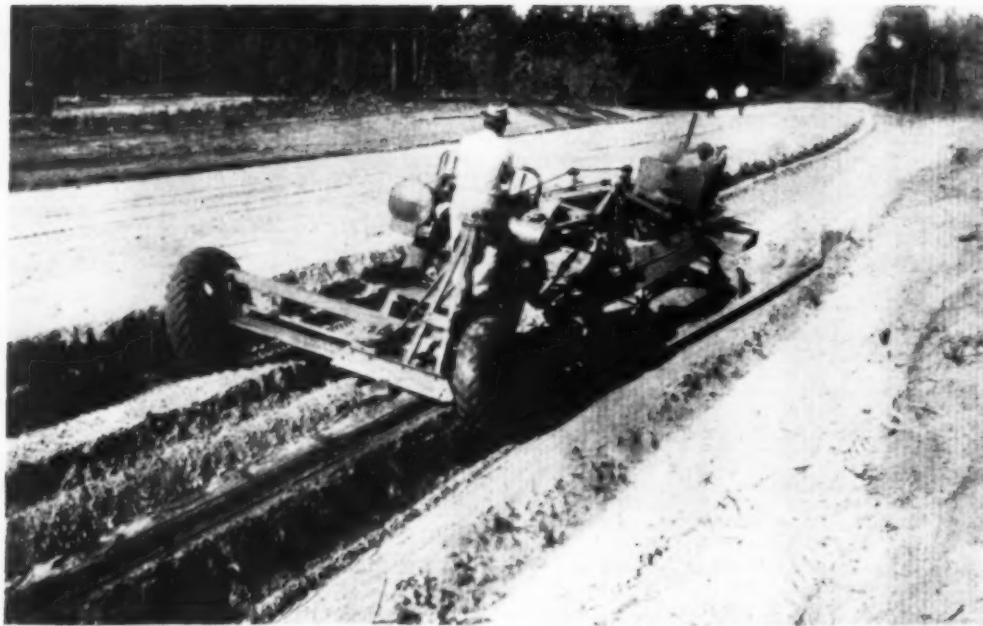


MOTOR GRADER (below) trims and reshapes grade, left by preceding contractor about 4 in. high at center line and about 2 in. low at outside form line.

Traveling Plant LAYS SAND-ASPHALT COLD MIX

By T. V. FAHNESTOCK

Bituminous Engineer,
North Carolina Highway Commission,
Raleigh N. C.



PREPARATION OF SUBGRADE in sandy soil is handled by leaning-wheel motor grader.

IN MAY, 1938, the North Carolina State Highway and Public Works Commission awarded a contract to the W. L. Cobb Construction Co., of Decatur, Ga., for the construction of 15.7 mi. of Route 53 in Bladen-Pender Counties. The project is located in the coastal plain area of North Carolina, approximately 35 mi. northwest of Wilmington and is divided into two parts. Part 1 begins at the town of Atkinson and extends for a distance of 3 mi.; Part 2 begins near Kelly and extends to White Lake, a popular summer resort. The project was not continuous and there remains a gap of approximately 11.6 mi. between Part 1 and Part 2 which will be let to contract at a later date. The Cobb contract entailed



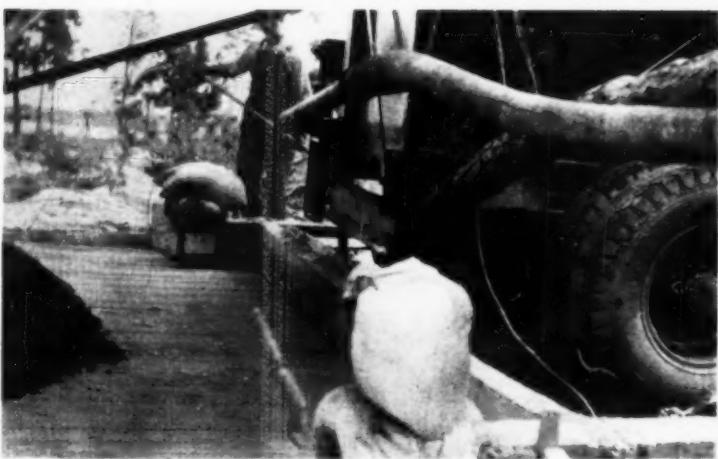
WINDROW GAGE is used to determine approximate amount of sand along middle of subgrade.

the moving of approximately 130,000 cu.yd. of unclassified excavation and 70,000 cu.yd. of borrow excavation together with drainage structures consisting of concrete box culverts and pipe lines. The pavement was a sand-bituminous type having a compacted thickness of 5 in. and a width of 20 ft. constructed on a grade 30 ft. wide on fills and 40 ft. in cuts.

In the area traversed by the project the soil consists mainly of Norfolk sand. It was possible, therefore, to use the material occurring in the subgrade for the construction of the pavement on most of the project, the exceptions being the portion near Atkinson where the subgrade consists of clay loam and the



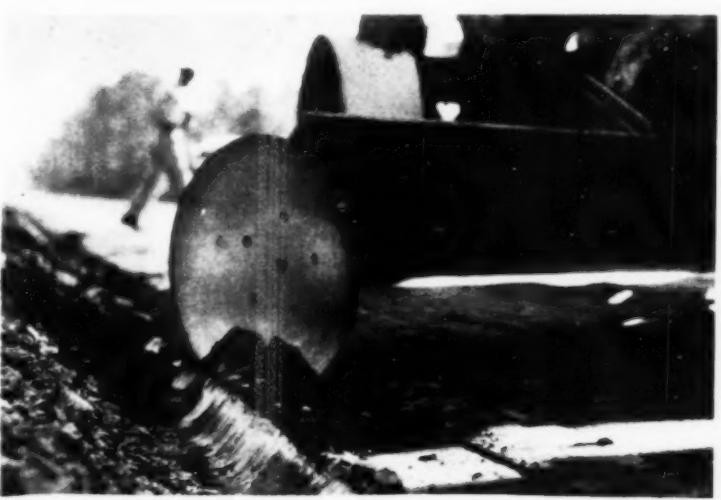
TRAVELING MIXING PLANT picks up windrowed sand from subgrade, applies cut-back asphalt and deposits cold-mix at rear for spreading.



BOARD TOWED BEHIND MIXER levels off subgrade before asphalt-sand mix is deposited.



SAND-ASPHALT COLD-MIX is deposited in windrow behind traveling plant.



EDGE OF PAVEMENT is cut to accurate line by disk bolted to moldboard of road-grader.



BITUMINOUS "SNOW PLOW," consisting of A-frame mounted on front of tractor-bulldozer, spreads and manipulates mixed material.

sections where the location was through low, swampy areas. In these cases sand for the pavement was hauled in from borrow pits.

Sand Grading

The specifications for the sand-bituminous pavement called for the use of rapid curing cut-back asphalt, the grade used being designated by the engineer. Mixing could be either by traveling mixing plant or by strictly road-mix methods. The contractor elected to use a Barber-Greene traveling plant. Since the machine used for the mixing proportioned the aggregate and bituminous material by volume, tests were run on the sand to determine the bulking at different moisture contents. In this manner, when knowing the moisture content of the sand, it was possible to regulate the quantity of cut-back asphalt so as to obtain the desired bitumen content in the completed pavement. An accompanying table shows typical gradings for the sand used.

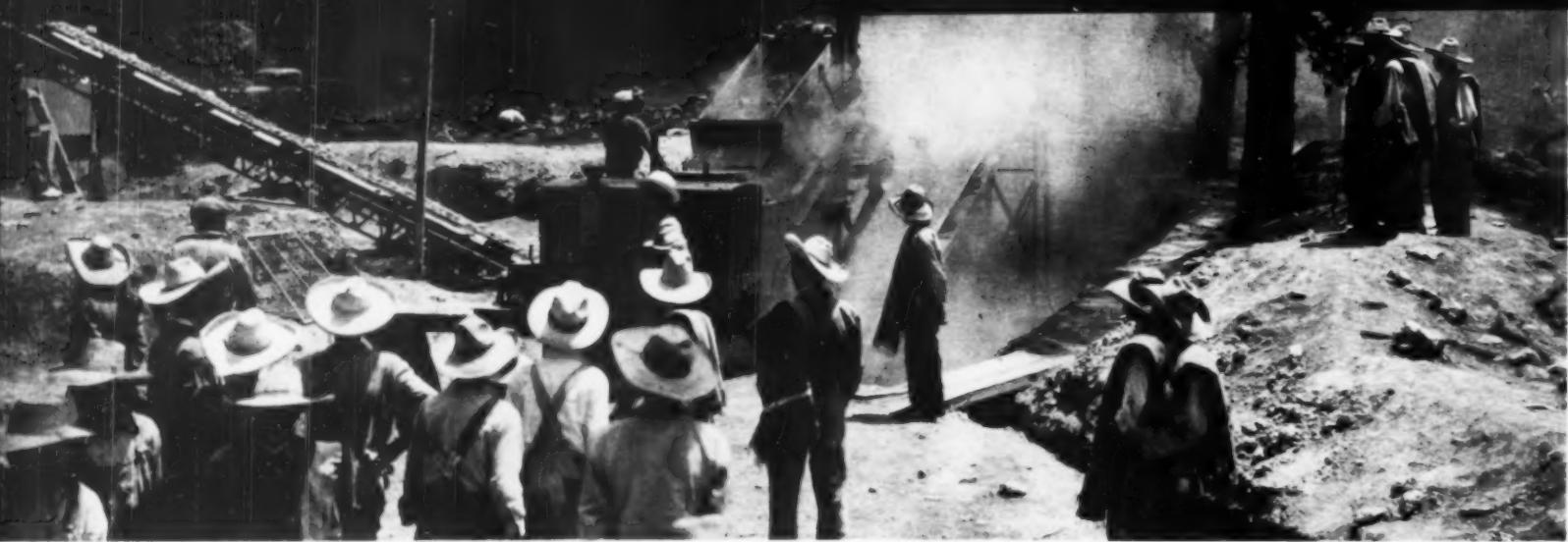
It will be noted that the sand contains a relatively small amount passing the 80- and 200-mesh sieves, so that it was desirable to use a rather low bitumen content, this being held within the limits



SPRING-TOOTH HARROW aerates mixed sand-asphalt on subgrade.



COMPLETED PAVEMENT, with compacted thickness of 5 in. of sand-asphalt, has width of 20 ft.



MEXICO — One of five identical rock-crushing plants (Pioneer) producing material for base course for road between Mexico City and Guadalajara.



ROUTE of Pan-American Highway connecting two continents.



COLOMBIA — Dense graded aggregate for bituminous road surface is mixed in place by pneumatic-tired motor-grader (Caterpillar).

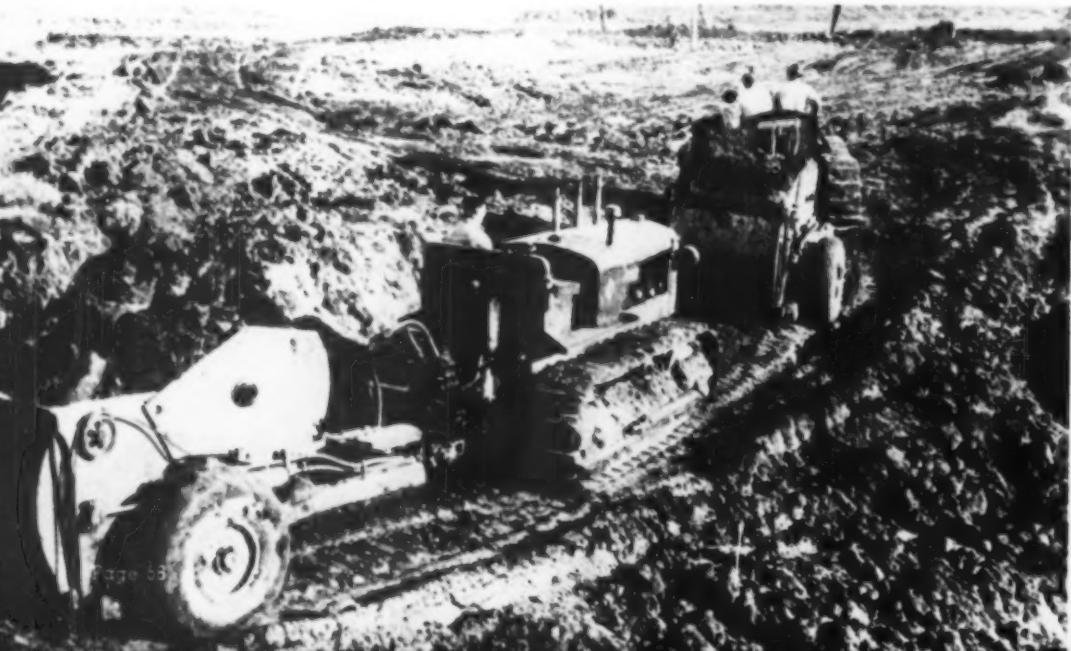
Latin American Road-Builders PUT **U**

THE ACCOMPANYING ILLUSTRATIONS indicate typical applications of methods and of equipment manufactured in the United States on the extensive road-building operations, including the 16,000-mi. Pan-American highway and branch roads, now in progress in Central and South American Countries.



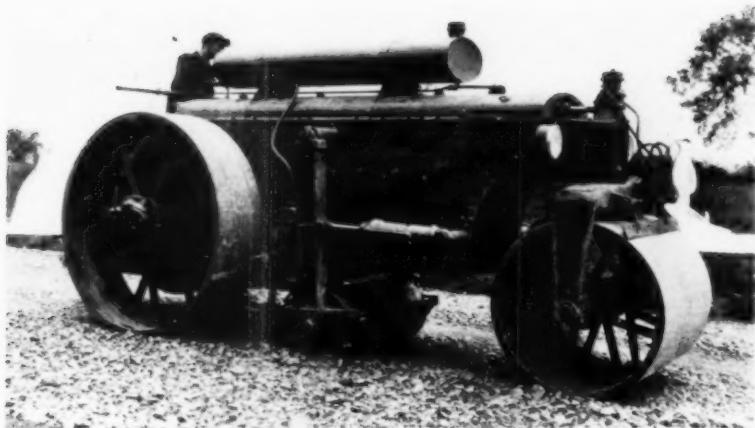
ARGENTINA — In Province of Entre Ríos earth for backfill against bridge abutments (**below**) is moved by tractors (Allis-Chalmers) hauling pneumatic-tired scrapers (Continental).

BRAZIL — Grading on Rio-Caxambu highway, following route of Emperors' Highway built by slaves in 1840, is done by Carrall scraper (Le Tourneau) hauled by diesel-powered tractor (Caterpillar).

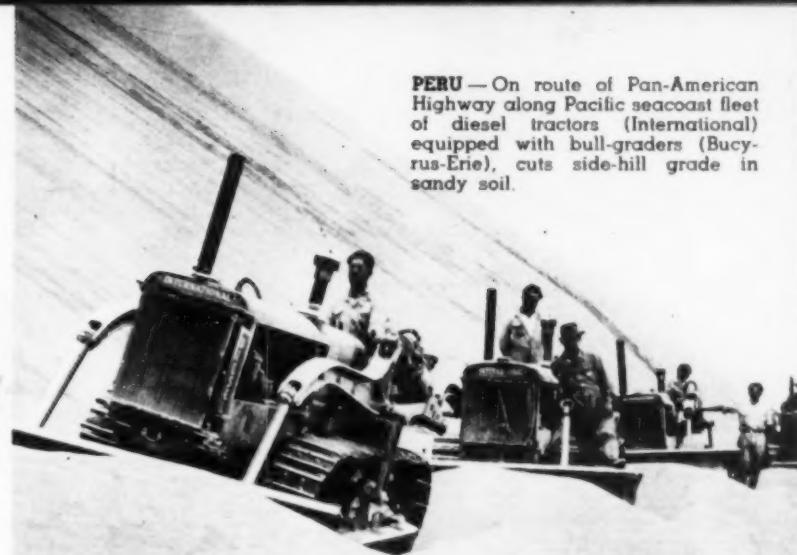


URUGUAY — Modern concrete pavement (**below**) with center line stripe makes possible transport by automobile instead of two-wheeled native ox-cart.





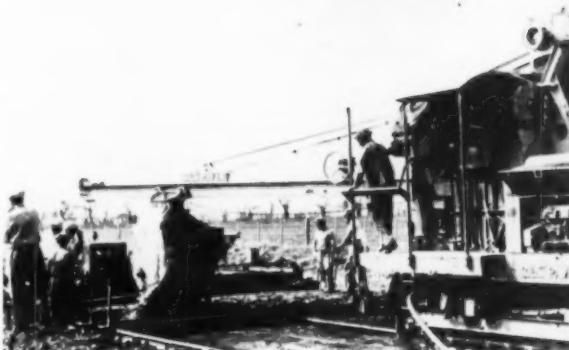
ARGENTINA — Modern gasoline-powered road roller (Austin-Western) equipped with intermediate roll-a-plane between front and rear main rolls compacts crushed stone base.



PERU — On route of Pan-American Highway along Pacific seacoast fleet of diesel tractors (International) equipped with bull-graders (Bucyrus-Erie), cuts side-hill grade in sandy soil.



MEXICO — Bituminous road machine (Jaeger) picks up windrowed aggregates (left), applies asphalt binder delivered by tank-truck, and deposits mix at rear, ready for spreading and rolling.



ARGENTINA — Operated by contracting firm of Sabaria & Garassino, Ltd., modern 27E paving mixer (Chain Belt) places concrete for pavement in Santa Fe Province.



ARGENTINA — Side-casting of material for road construction in Province of Corrientes is handled by elevating grader (Austin-Western) operated by crawler tractor (Allis-Chalmers).

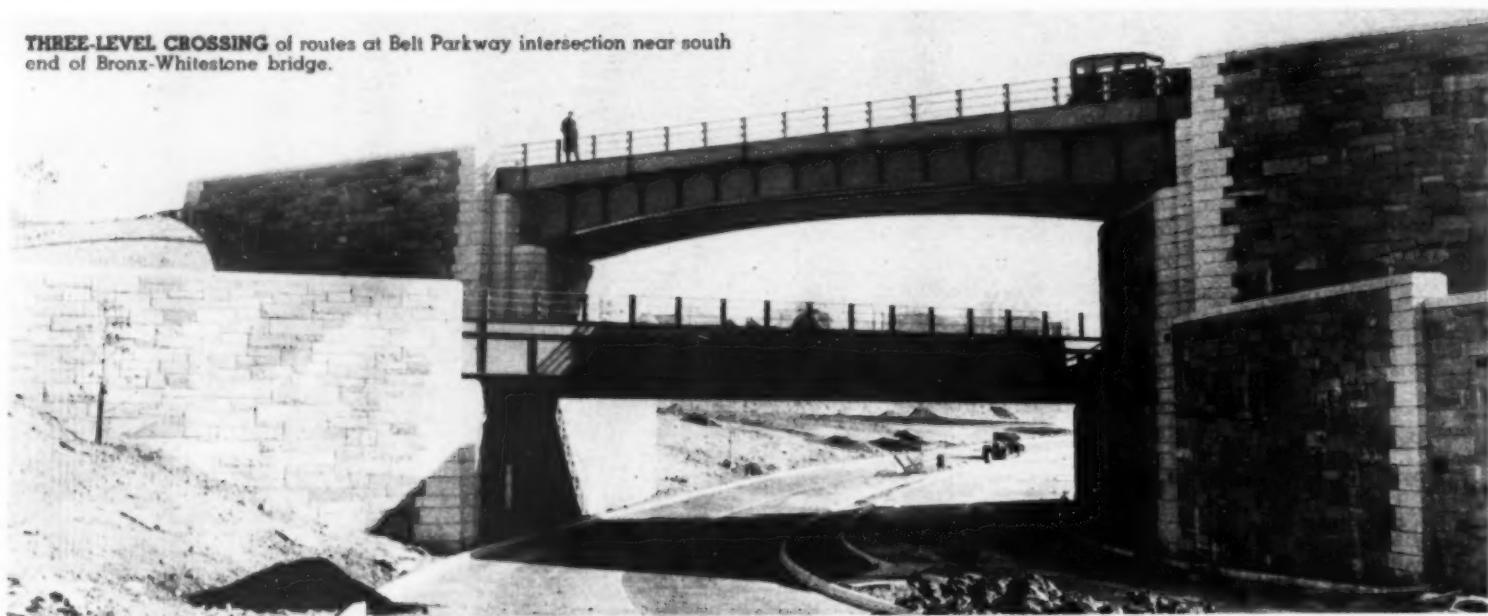


CHILE — Working in vicinity of Santiago diesel-powered motor-grader (Caterpillar) shapes road surface.

VENEZUELA — Side-hill cut (below) for new highway between Bocono and Borquisimeto is made by $\frac{3}{4}$ -yd. power-shovel (Lorain), one of seven owned by Venezuela Department of Public Works.



THREE-LEVEL CROSSING of routes at Belt Parkway intersection near south end of Bronx-Whitestone bridge.



Belt Parkway

Provides 31-Mi., Six-Lane, Concrete-Paved Arterial Route With Grade Crossings Eliminated by 70 Bridges

WHEN THE BELT PARKWAY, six-lane concrete-paved circumferential superhighway girdling New York City's boroughs of Queens and Brooklyn, is opened to traffic July 1, 1940, motorists traveling within the city limits on Long Island will be able to avoid traffic congestion and to proceed, without stops, along a 31-mi. route on which a total of 70 bridges eliminate all crossings at grade. The project, now nearing completion at a cost, for construction alone, of \$28,000,000, marks the fruition of plans developed by Commissioner Robert Moses of the city's Department of Parks, in cooperation with the New York State Highway Department (J. J. Darcy, district engineer) and the firm of Madigan-Hyland, engineering consultants.

Modern Design Features

The new parkway embodies these elements of modern arterial highway design: Multiple-lane main route construction of ample widths, paralleled by adequate service roads; division of lines of traffic in opposite directions by a central mall or separating strip of 10-ft. minimum width, to prevent collisions; white cement curbs as a safety guide for night driving; complete absence of grade crossings by carrying important cross-streets on bridges or dead-ending minor thoroughfares; increased width of pavement to provide safe acceleration lanes for vehicles entering the parkway from access roads; ample sight distances at curves; guard rail where needed to insure safety; pedestrian underpasses or overhead crossings where needed; elimination of glare from paved concrete roadway surfaces by the addition of a darkening agent in the top course of the mix.

Other features include: Restricted frontage along right of way and attractive landscaping of parkway strip to foster desirable residential growth along route; lighting to make night driving easy and safe; cross-drainage to both the sides and the center of the six-lane divided roadway; contrast in color of concrete slabs forming main route traffic lanes (dark) and exit lanes (light) by spraying black bituminous curing agent on former and transparent curing agent on latter, thus preventing motorists from turning out, unintentionally, on to exit road; banking on curves of less than 8,000 ft. radius; vertical clearances under bridges of 14 ft. at center and 12 ft. at outside curbs.

Non-stop, 31-Mile Route

As indicated on the accompanying map, the Belt Parkway starts in Brooklyn at Owl's Head Park along the waterfront of Upper New York Bay, proceeds south and east along the shore line of Gravesend and Sheepshead Bays, across Marine Park, connecting by means of Flatbush Ave. with a spur from Marine Parkway, bridge and passing to the north of the

(Continued on page 62)



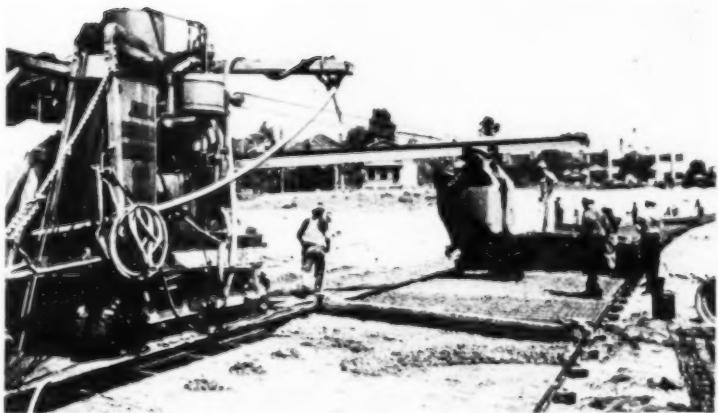
ROUTE OF BELT PARKWAY covers 31 mi. between Owl's Head Park on Brooklyn waterfront and Bronx-Whitestone bridge in Borough of Queens, with connections to Triborough bridge via Grand Central Parkway and other main traffic arteries.



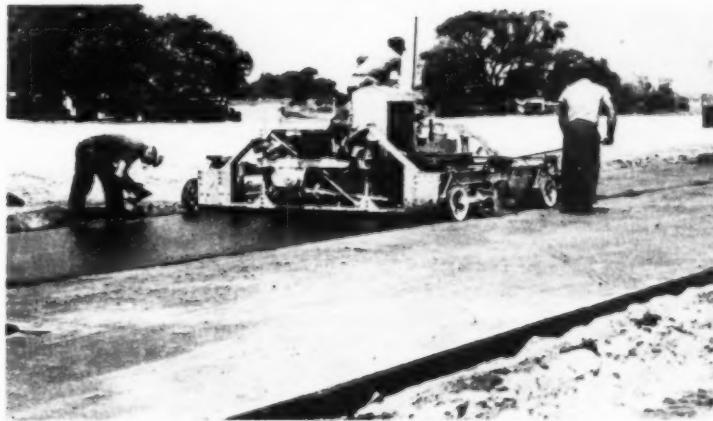
BELT PARKWAY near its northerly end, looking west toward Whitestone intersection bridge, showing main concrete-paved route and service roads both with white cement curbs.



FOUR TRAFFIC LANES are paved at present on Cross Island section of Belt Parkway. Ultimately two inner lanes (making six in all) and 10-ft wide central dividing strip will be added to complete project as originally designed. In background is typical rigid frame bridge, one of 70 structures built to eliminate grade crossings on 31-mi. route.



POURING OF CONCRETE on lane of parkway is done with standard paving mixer. In foreground note transverse dowel bars extending out from keyed joints and held in horizontal position by mounds of concrete. Screed rides on forms to strike off bottom course of concrete to thickness of 6 in. prior to placing steel mat reinforcement and adding 2-in. dark-colored top course of pavement. (Photo, National Excavation Corp.)



GASOLINE-POWERED FINISHING MACHINE strikes off paved surface of 8-in. thick slab on southbound traffic lane of Shore Parkway section of belt route.



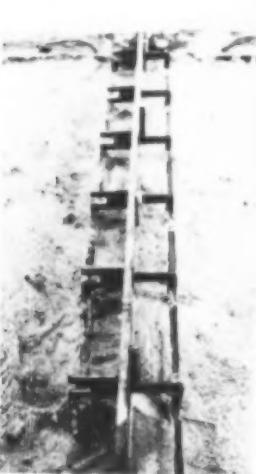
WHITE CEMENT CURB is built along edge of pavement as guide for night driving. Batches from portable mixer are delivered by two-wheeled rubber-tired carts and hand-shoveled into forms. One view shows portion of completed curb and worker setting forms for next pour.

(Continued from page 60)

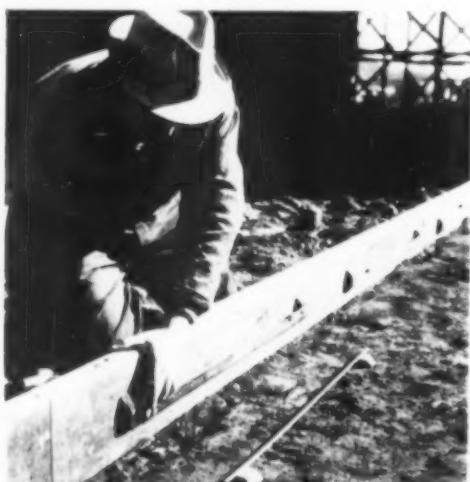
airport at Floyd Bennet Field. Thence it heads northeast along a section of hydraulic fill dredged from Jamaica Bay to a junction with a section of the old Sunrise Highway, now known as Southern Parkway, which is being rebuilt as a parkway to carry six passenger traffic lanes, seven business traffic lanes on service roads. By way of Laurelton Parkway the belt route proceeds north and west, as the Cross Island Parkway, along the Queens-Nassau county line, across Grand Central Parkway, skirting the shore line of Little Neck Bay to make a connection with the new Bronx-Whitestone Bridge crossing the East River and providing a connection with



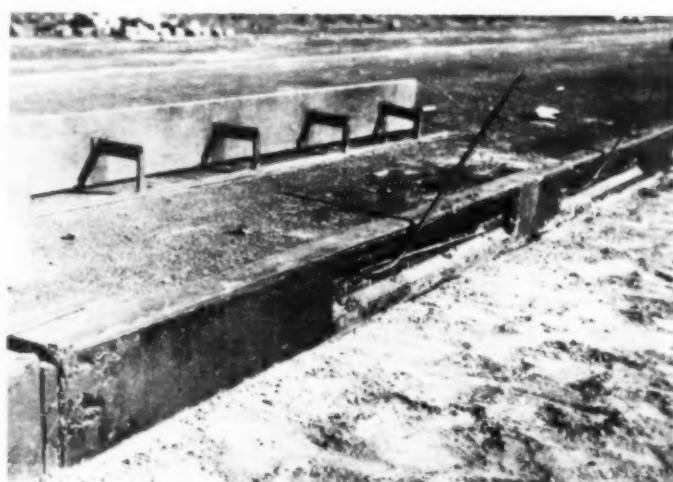
SANDY SUBGRADE is encountered by paving crew on section of belt parkway near Jamaica Bay. In foreground are built-up truss assemblies, with redwood plank filler, for forming transverse expansion joints.



TRANSVERSE JOINTS are formed with aid of load-transfer truss assemblies in which rectangular steel dowels slide in sockets. Joint filler is 1 1/16-in. wide redwood plank.



PLATES ATTACHED TO INSIDE FACES of forms serve dual purpose of forming groove for keyed longitudinal joint between slabs and also creating niche in which bent halves of transverse steel dowels are set.



KEYED LONGITUDINAL JOINTS with transverse steel dowels (which are later straightened out to horizontal position) are cast in side of slab with aid of plate illustrated in another photo on this page. On top of slab is load transfer dowel assembly, with redwood plank filler to form transverse joint.



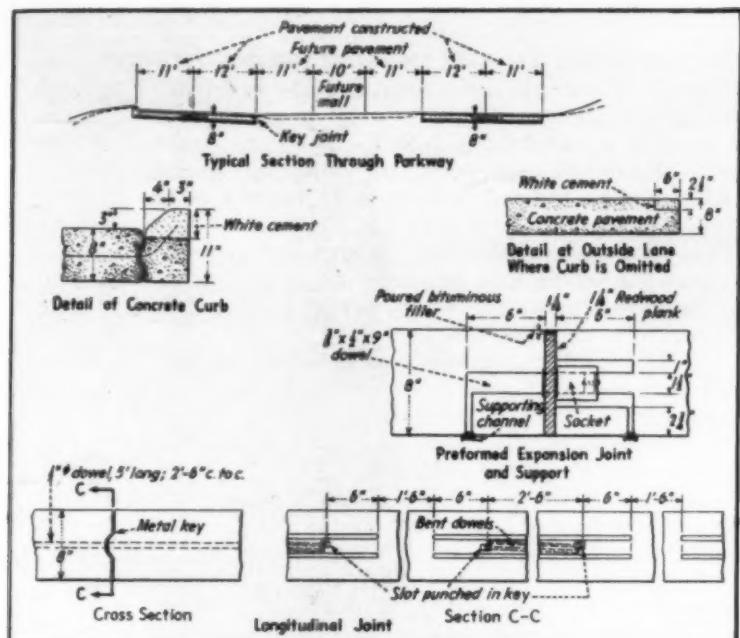
TYPICAL BRIDGES of rigid frame, steel girder and elliptical arch types, which eliminate 70 grade crossings on 31-mi. route of Belt Parkway.

the Borough of the Bronx and the parkway systems of Westchester County to the north.

Six-Lane Divided Pavement

The roadway in its completed form, as indicated in the accompanying cross-section, has a minimum width of 78 ft., consisting of six concrete-paved traffic lanes (three in each direction) and a dividing strip at least 10 ft. wide.

For the present, except along the reconstructed six-lane section of the Sunrise Highway, only the two outer lanes (23 ft. in width) of the ultimate three lanes (34 ft. in width) on each side of the central dividing strip are being paved, but grading has been done to accommodate the last two, of the total of six, lanes, when needed. Thus the route, as now constructed throughout most of its 31-mi. length, carries four paved lanes, with provision for future installation of the two inner lanes when traffic demands justify them. Starting from the outside curb, the widths of the lanes on each side of the 10-ft. separating strip are, respectively, 11, 12 and 11 ft.



DESIGN DETAILS of white cement concrete curbs; transverse joints with load-transfer dowels and redwood plank filler, and longitudinal tongue-and-groove joint, with steel dowels between adjacent slabs

Under present conditions, with the inside lanes unpaved, the 12-ft. lanes will be the passing lanes for one car overtaking another, an extra 1 ft. of width being provided to give ample room for this purpose.

For the ultimate 34-ft. paved width of each half of the divided roadway cross-drainage is provided in two directions. The inside 11-ft. slab will slope toward the dividing strip at a rate of $\frac{1}{4}$ in. per foot. The 12-ft. center slab and the 11-ft. outside slab will slope toward the outer curb at rates of $\frac{1}{8}$ and $\frac{1}{4}$ in. per foot respectively.

Joint Details

The pavement is a concrete slab with a uniform thickness of 8 in., reinforced with welded steel mats placed 2 in. below the roadway surface. Transverse joints are spaced at distances of from 89 ft. 4 in. to 98 ft. apart. These joints, of the Godwin type, illustrated here-

with, are formed by a redwood plank-filler 1 1/16 in. thick, held in place by a self-aligning welded steel truss assembly carrying $\frac{3}{8} \times 1\frac{1}{2} \times 9$ -in. dowels designed for load transfer between the ends of abutting slabs. The end of the steel dowel bar extends into a pocket to permit sliding movement as the pavement expands or contracts due to temperature changes. The dowel bar truss assemblies, of which there are eight per joint for an 11-ft.-wide slab, are supported by vertical legs on a pair of horizontal steel channels, extending across the subgrade parallel to and 6 in. out from each side of the redwood plank filler. The top of the joint is sealed by a poured bituminous filler. Redwood is selected for the joint filler because of its straight grain and freedom from knots.

The main feature of the longitudinal joints is the interlocking of adjacent slabs by a succession of tongue-and-groove, load transfer keys 3 ft. 6 in. long, spaced 5 ft. apart on centers. In

each key are a pair of transverse $\frac{1}{2}$ -in. steel dowels 5 ft. long, spaced 2 ft. 6 in. apart. An ingenious device enables each dowel, bent at right angles in the middle, to be set in place prior to concreting so that one-half of its length is embedded in the slab being poured and the other half is left free for extension into the adjacent slab when it is paved later. A deformed metal plate, slotted to receive the two dowel bars for each key, is attached to the inside vertical face of the road form, as illustrated, forming a recess or long niche which receives the bent halves of the steel bars and also forms the groove cast in the side of the slab for the tongue-and-groove joint. After concrete is poured and forms are stripped, the bent half of each dowel, shielded from contact with the concrete during pouring, is straightened out to extend into the adjacent slab when concrete is poured for the next parallel traffic lane.

(Continued on page 100)



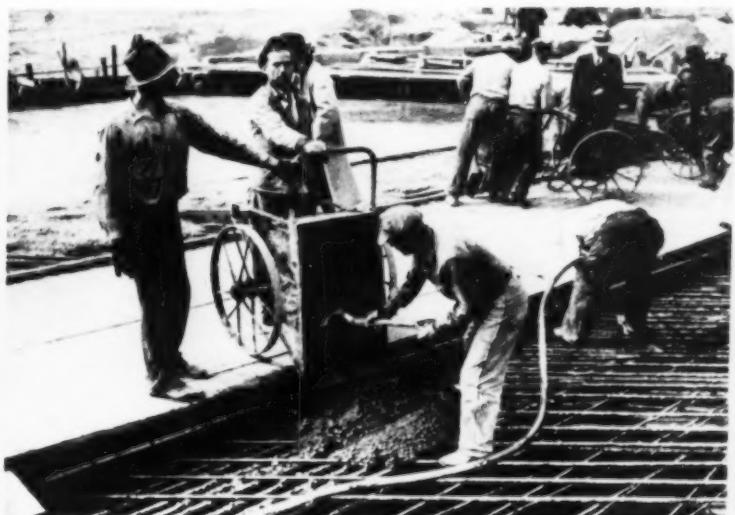
BRIDGE CONCRETING is done by chute from truck-mixer (left) and by two-wheel carts (right) on plank runway. (Photos, National Excavation Corp.)



PEDESTRIAN UNDERPASS, faced with brick masonry, affords safe crossing of belt highway at point where adjacent streets are dead-ended.



CURING OF FRESH CONCRETE is done with bituminous spray from pressure tank on two-wheel cart. (Photo, National Excavation Corp.)





Deep Open Cut MOVES CALIFORNIA HIGHWAY TUNNEL BOTTLENECK

By JOHN D. GALLAGHER
Assistant Highway Engineer,
California Division of Highways,
Sacramento, Calif.

BY CONVERTING AN OLD, NARROW HIGHWAY TUNNEL into an open cut 200 ft. deep, requiring the removal of 611,000 cu.yd. of material, California's Division of Highways has eliminated a traffic bottleneck north of Los Angeles, on the route between the San Fernando Valley and Antelope Valley, Owens Valley and the northwestern portion of the colorful Mojave Desert. Built in 1910, the Newhall tunnel, just south of the town of that name, had an arch section only 17 ft. 5 in. wide at the spring line, causing intolerable traffic congestion on Sundays, during the wildflower season when 20,000 cars attempted to use the route in 9 hr.

On May 5, 1938 a contract was awarded for reconstruction of this portion of the route as a unit in the program for a new alignment of the highway between the San Fernando Valley and Mojave along the so-called Mint Canyon short-cut. The contract included construction of 3.73 mi. of state highway, between the junction with the Foothill Boulevard, at Tunnel Station, to Placerita Canyon on the Mint Canyon cut-off, where a connection was made with another unit of the general improvement. From Tunnel Station, which is about 1 mi. south of the tunnel, to a point almost 1 mi. north of the tunnel, the project followed the old road. The contract called for a divided highway, with two 12-ft. center lanes of plant-mixed surfacing and two outside lanes of Portland

NEW HIGHWAY THROUGH DEEP CUT (left) is divided route with two 12-ft. center lanes of plant-mixed surfacing and two 11-ft. outside lanes of portland cement concrete.



ABOVE OLD TUNNEL PORTAL terrain on line of cut rises to height of 200 ft.

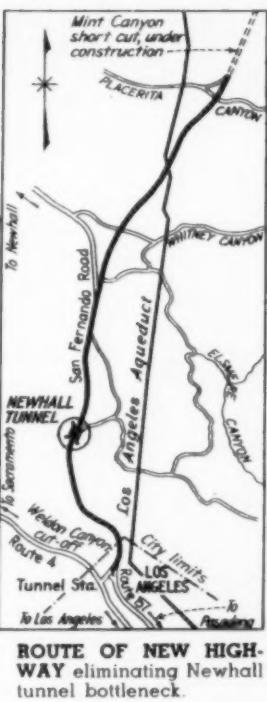
cement concrete, each 11 ft. wide, with 7-ft. shoulders. The central dividing strip is 4 ft. wide with concrete curbs.

At the point 1 mi. north of the tunnel, the new highway leaves the road to Newhall and bears to the right on new alignment as part of the Mint Canyon cut-off. This section was constructed with a three-lane plant-mixed surface 33 ft. wide and 8-ft. shoulders.

The major interest of the contract centered around the replacement of the tunnel with an open cut and this phase of the contract was graphically presented in the final report on the work submitted by S. V. Cortelyou, district engineer at Los Angeles. The tunnel was 435 ft. long, concrete lined, with a grade line 200 ft. below the top of the hill and entirely within the prism of the proposed cut. Investigation had shown the hill to be composed of cemented conglomerate and sandstone, indicating that no serious difficulty would be encountered in excavation. As traffic was carried through the tunnel during construction, protection from falling material at the tunnel portals was provided by a 30-ft. timber extension of the tunnel on I-beam posts and caps. The extension above the tunnel portal also provided a suitable area for the operation of power shovels and trucks and was used first at the north portal, then moved to the south portal to serve the same purpose. Ramps were constructed from the existing road to the area above the tunnel.

The greater portion of the material in the cut was loosened with rooters and bulldozed from the top of the cut to the working area above the tunnel portal where it was loaded by two 2½-yd. shovels into a fleet of sixteen 10-yd. dump trucks. The cut was designed for ½:1 slopes. No blasting was done in the removal of the upper 120 ft. of the cut. When excavation had reached a point about 60 ft. above the tunnel

TUNNEL CUT required removal of 611,000 cu.yd. of material, consisting of cemented conglomerate and sandstone, by power shovel on loading area fed by bulldozers. Traffic was maintained through tunnel during excavation of cut above it.



ROUTE OF NEW HIGHWAY eliminating Newhall tunnel bottleneck.



ON STEEP SLOPE tractor-bulldozers push material down to point of loading by power shovels into 10-yd. dump-trucks.





SOUTH THROUGH TUNNEL CUT completed roadway has 4-ft. center strip with white cement concrete curbs, two 12-ft. inner lanes of bituminous surfacing, two 11-ft. outer lanes of portland cement concrete and 7-ft. shoulders.



DRAINAGE DITCH along portion of new highway was built with curved cross-section paved with asphaltic concrete spread by hand on wire mesh reinforcement for compacting by 8-ton tandem roller.

roof drilling and blasting operations were begun. Holes were drilled with a wagon drill rig to depths of 35 to 40 ft. and the material loosened with charges of approximately 1,000 lb. of black powder to each hole. In order to minimize loosening material in back of the designed slopes firing was limited to four holes at a time.

Operations advanced until excavation had been completed to an elevation about 10 ft. above the tunnel roof (about 30 ft. above the roadbed grade) when a slide occurred on the easterly slope which entirely blocked the south portal of the tunnel. The slide moved along one of several slip planes which dipped toward the roadbed at angles of from 20 to 35 deg.

Slope design on the easterly side was then changed to 1:1 and approximately 42,000 yd. of material from the top 65 ft. of the cut placed in adjacent canyons by the use of bulldozers and Carryall scrapers. From this point the material remaining back to the 1:1 slope was brought into the cut by blasting and bulldozing where it was loaded into trucks with power shovels and hauled to widen fills.

Slides Complicate Problem

The 1:1 slopes did not, however, prove to be sufficiently stable and another slide came in on the easterly side near the north end of the cut. On this portion the slopes were flattened further to 1½:1. Just after this work was completed a triangular wedge of about 500 cu.yd. slid out in back of the 1½:1 slope, indicating that eventually all the material above the slip plane might slide into the cut.

At the same time other slides occurred at the southerly end of the cut and in high cuts immediately south of the tunnel cut. In all cases it was noted that the material had broken out in triangular sections, bounded on the south-



CONSTRUCTION OF FILL about 1½ mi. north of tunnel cut was handled by scrapers, bulldozers, trucks and rollers.



KNOCKING DOWN RIM over south tunnel portal was done by loosening material with rooters and pushing it with bulldozers to loading area.

(Continued on page 118)



DUAL SHEEPSFOOT TAMPING ROLLERS drawn by pneumatic-tired farm tractors consolidate clay-gravel base to 5-in. compacted depth. For 24-ft. roadway, base compaction requires 57 dual-sheepsfoot-roller hours per mile.

30 Miles in 60 Days

ROLLERS OF THREE TYPES COMPACT PLANT-MIX STABILIZED BASE



FINAL BASE COMPACTION is accomplished by heavily loaded pneumatic-tired roller with tires inflated to 35 lb. per sq.in. Base has been shaped to 5-in. crown, checked by templet.



**17-TON TANDEM
FLAT ROLLER** (left) converted from steam to gasoline power, makes two passes over surface of 5-in. compacted base.

**WORKING IN CON-
JUNCTION** with other flat rollers (right), water-filled pull-type cylinder irons out surface irregularities in stabilized base.





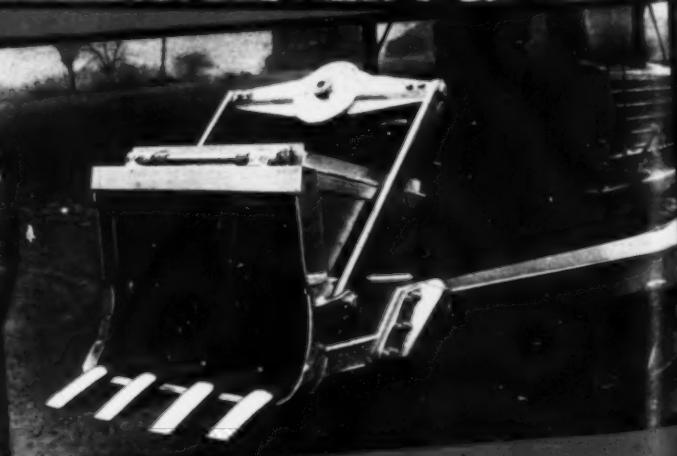
THE LOAD

The tractor fills the bucket by backing up. A straight line "push", with the whole power of the tractor transmitted to the bucket teeth. The bucket is in full view while it is being filled—and you can fill it to the limit, because it is in view for lifting while crowding.



THE ONE MAN SNOW LOADER

The big snow bucket will crowd into frozen snow without using a gang of pick-ax men to break it up. With your trained operator and plenty of snow, you can handle four buckets a minute, and throw them into a truck or gondola car. Here is the combination that will cut your snow removal bills to the bone. The Model "B" Cletrac uses a $1\frac{1}{2}$ yard snow bucket. The Model "D" Cletrac uses a 2 yard snow bucket.



THE CLEVELAND TRACTOR COMPANY . . . CLEVELAND, OHIO . . . COMPLETE

THE BLACK!!!

SARGENT Overhead Shovel and Bulldozer

MODEL "B" CLETRAC

35 H.P.

USES $\frac{3}{8}$ YARD DIRT BUCKET

MODEL "D"

61 H.P.

USES $\frac{3}{4}$ YARD DIRT BUCKET

THE SWING

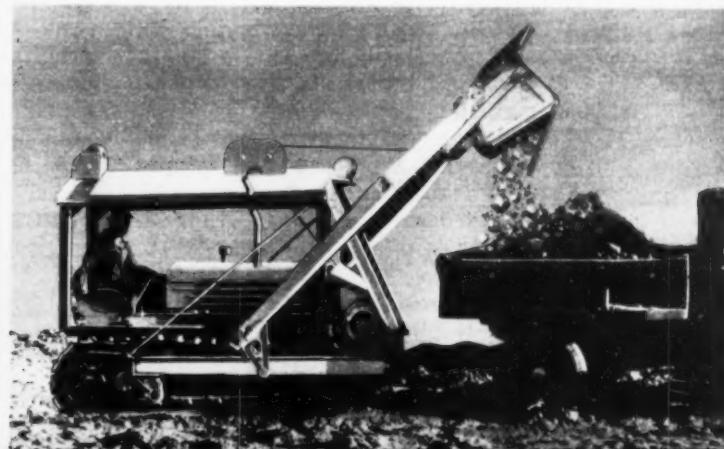
After loading, the bucket is swung up and over the tractor by a powerful gear hoist driven by the front power take-off of the tractor. While the bucket swings up and over, you move the tractor forward to the dump or truck. The bucket is stopped by a foot brake, when in dumping position.



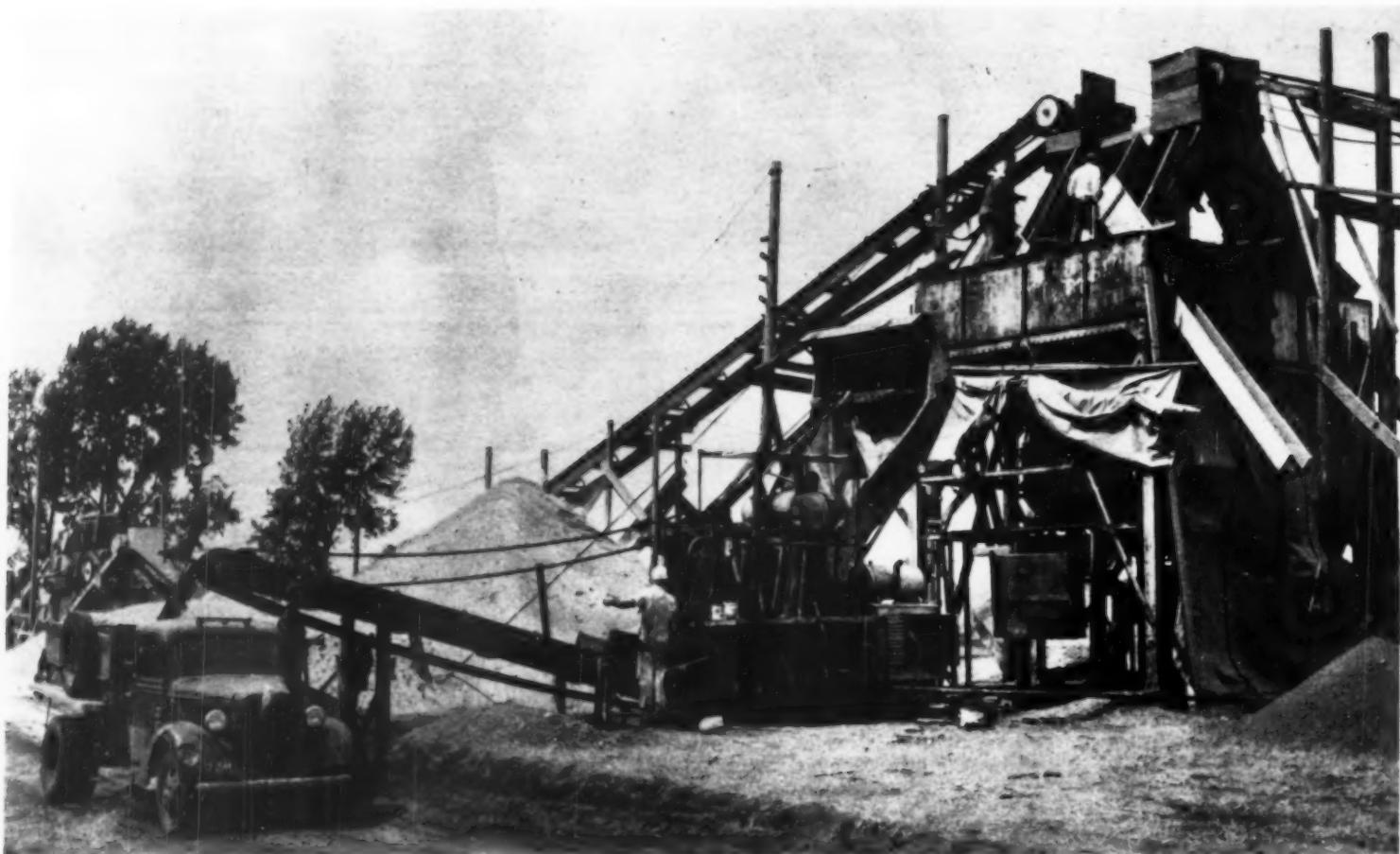
THE DUMP

At this point, the weight of the loaded bucket is taken off the tractor springs by a heavy duty caster wheel mounted under the shovel frame.

THE GROUND SUPPORTS THE LOAD! After tripping, throw in the hoist to return the bucket to digging position. Four buckets a minute is practical for your operator in average digging.



The bulldozer controls are simple and fast. You drop the bucket to lift the blade, and lift the bucket to lower the blade. Here is one bulldozer that has the full horsepower and weight of the tractor on the down thrust. When the blade is lifted, the tractor balances almost at its center. This assures long life for idler bearings and track wheels.



compaction, presented no problem in completing the work on time.

Important to the successful execution of the work was the rapidity with which sheepfoot rollers got on the mixed material after it had been dumped. Spreading and compacting rarely lagged more than 200 ft. behind the dumping. To assure no interruption of base construction, the contractor completed scarifying and compacting subgrade to 6-in. depth for practically the entire length of each project before starting to place base material.

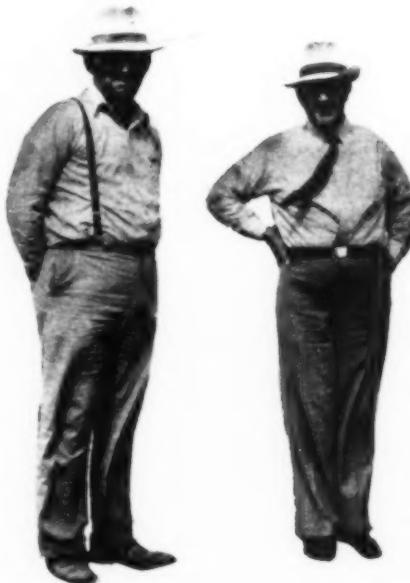
Compacting equipment worked 24 hr. a day 6 days a week, and the mixing plant and truck hauling fleet operated 21 hr. each day. Base construction required 3,770 tons of stabilized mixture per mile. Plant production ordinarily ranged from 4,000 to 4,400 tons in 21 hr., all of which was spread and given

initial compaction with sheepfoot rollers the same day. On the first of the four projects, the plant produced 29,444 tons in 127 hours, an average of 232 tons per hour.

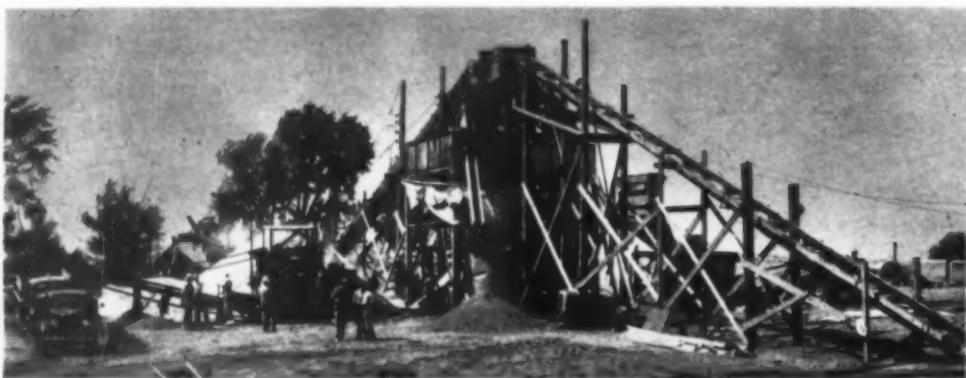
Mixing Plant — Two 27E pavers, a Foote and a Koehring, set back-to-back and served by separate Butler weighing hoppers for sand-gravel and for clay, turned out 2,800-lb. batches. Pit-run sand-gravel excavated by two $\frac{3}{4}$ -yd. draglines was trucked to the plant and dumped on the feeder conveyor of a Cedar Rapids screening and crushing plant equipped with a Williams slugger type hammer mill. A Cummins 150-hp. diesel engine powered the screening plant and pulverizer.

Oversize gravel retained by a 1-in. screen went through the pulverizer. The entire output of pit-run material, both crushed and uncrushed, traveled over a

STABILIZED MATERIAL made up of sand-gravel and clay, metered by weigh batchers under two-compartment bins and mixed by 27E paver, passes over belt loader into truck carrying three 2,800-lb. batches. Broad chute feeding sand-gravel and clay from batchers into mixer skip folds out of way as skip is raised.



IN CHARGE OF CONSTRUCTION for contractor and for Iowa Highway Commission: Faye C. Moubry, superintendent, Concrete Materials & Construction Co., and Frank H. Mann, assistant chief engineer.



MIXING PLANT (left) turning out more than 4,000 tons per day of stabilized material has two 27E pavers set back to back below separate bins and weighing batchers. Clay goes up inclined conveyor in right foreground, and sand-gravel comes up belt from crushing and screening plant in background.



STABILIZED MIXTURE of sand-gravel and clay is dumped on subgrade at rate of 230 tons per hour for fast spreading and compacting.



DIESEL AUTO GRADER strikes off dumped loads of stabilized mixture and spreads material for compacting by sheepfoot rollers.

discharge belt from the screening plant to a 24-in. by 90-ft. inclined conveyor which elevated the sand-gravel to one compartment of each of two Butler 50-ton overhead bins serving the two mixers. A Waukesha 60-hp. gasoline engine pulled the sand-gravel belt.

Clay, trucked to the plant and dumped in stockpiles, was pulverized with disk harrows before being fed by fresno scraper to the boot of an 18-in. by 110-ft. belt carrying this material to the second compartment of each of the two overhead bins. A Chevrolet 35-hp. engine drove the conveyor.

Trucks — At the fourth set-up, the contractor hired nine 4-5-ton trucks to haul clay 35 mi. to the plant. This clay pulverized easily, and only 8 per cent had to be added to the mix to provide proper binder, whereas local clay was difficult to pulverize and was low in cohesive characteristics, from 20 to 25



SIDE-SLOPE CUTTER attached to blade of diesel motor grader trims edge of stabilized base to 5 on 6 slope. Base is 25 ft. wide at bottom, 1 ft. wider than at top.

per cent being required to produce a satisfactory mix. Because the plasticity index of the clay was high, the contractor added 4 per cent sand by hand at the mixer skips to cut back the plasticity index to the specified 3 to 6 for fines passing the No. 40 sieve. Four 4-ton trucks hauled pit-run material from the draglines to the screening plant, a distance of about 1,000 ft.

Rented trucks carrying three 2,800-lb. batches to a load hauled stabilized material from the mixers to the sub-grade. On the fourth job, where the accompanying photographs were taken, the contractor used 35 trucks for the longest haul of 7 mi., one way. For a 3-mi. one-way haul, twenty trucks sufficed.

Water — Specifications stated that water in the mixture as discharged from the mixer should not be more than



WATER SUPPLY for two mixers and for tank trucks is taken from gravel pit by triplex road pump and by small centrifugal pump.



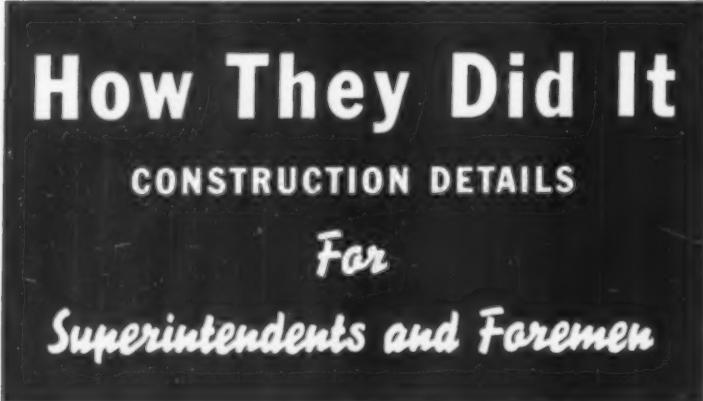
MIXING PLANT is full-time responsibility of Fred Fiala, plant superintendent.



TWO 1/4-YD. DRAGLINES load sand-gravel out of borrow pit into trucks to be hauled to mixing plant.



HIGH-SPEED TRACTOR-SCRAPER UNITS move earth on Pennsylvania Turnpike for two contractors, H. W. Shauell & Son, Mechanicsburg, Pa., and L. M. Hutchison, Mt. Union, Pa. Powered by Cummins six-cylinder diesel engine, 4 1/2-in. bore, 6-in. stroke, 672-cu.in. piston displacement, 150 brake horsepower at 1,800 r.p.m., Euclid tractor-scraper combination moves at speeds up to 20 m.p.h. while carrying pay loads of 8 to 9 cu.yd. in 12-yd.-capacity bowl, making unit economical to operate on hauls of 1,500 to 2,000 ft., for which Turnpike jobs show production figures running to 90 pay yards per hour per machine. Scraper loading is aided by pusher tractor.



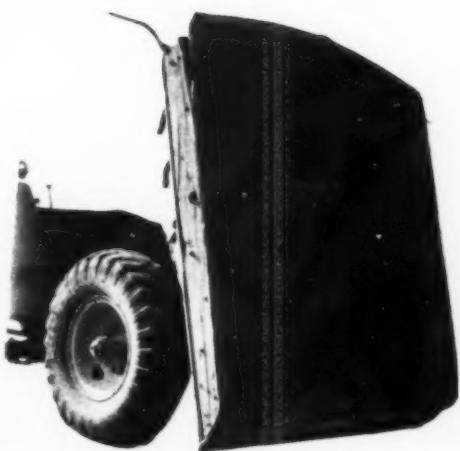
TO PREVENT BOGGING DOWN OF TRUCKS in sandy soil on section of New York City's Belt Parkway along Jamaica Bay, described elsewhere in this issue, contractors place welded mats of steel reinforcement to form traffic grid which proves effective in preventing tires from sinking.



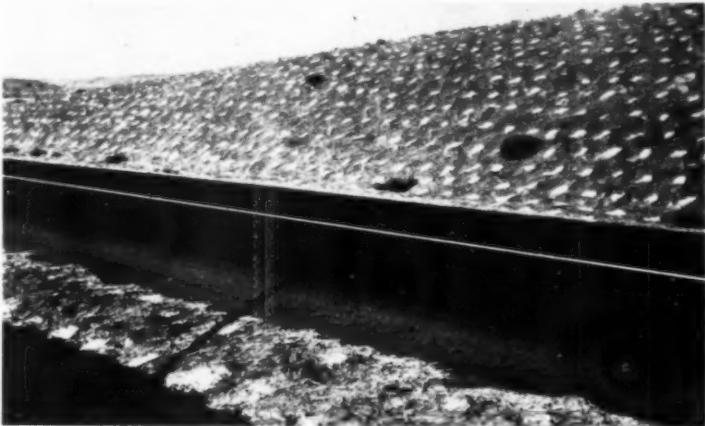
TUBULAR SPREADER attached to truck feeds chemically treated grits by worm screw to holes which drop abrasive on icy road, minimizing losses by wind, for Michigan State Highway Department. For complete ice removal, serrate (sawtooth) blade mounted under truck scores surface to aid penetration and loosening effect of calcium chloride.

SOIL-SAVER DROP INLET (right) developed by Missouri State Highway Department to conserve topsoil at upper side of highway embankments utilizes pipe-rail cattle guard because it is cheaper than grate and offers less obstruction to water. Alongside deep fills, department in some places constructs tall soil savers, putting lip of concrete riser below shoulder of fill at difference in elevation equal at least to depth of culvert plus 1 ft., to make sure that culvert will carry full head of water when necessary. In shafts of these tall risers, design calls for installation of vertical slots 1 in. wide by 1 ft. high to avoid ponding of water around structure. Slots are kept plugged 1 ft. above soil level as soil builds up.





STEEL BOTTOM PLATES hung by chains inside bodies of Koehring dumpers on Pennsylvania Turnpike grading contract of Herman Holmes, Crystal Falls, Mich., facilitate fast, clean dumping of moist earth.



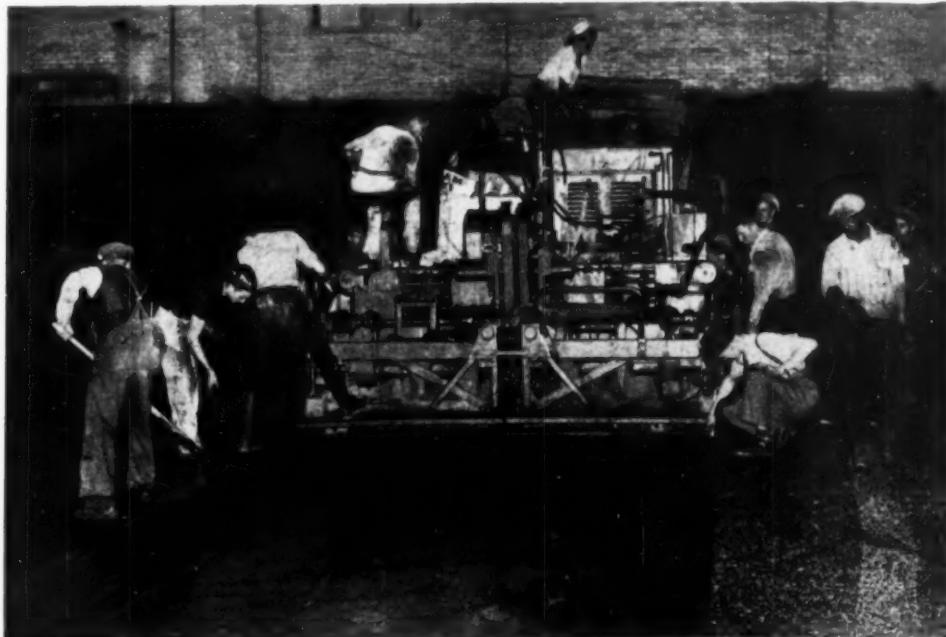
HAY MAT anchored by small piles of sand retains fine sand shoulders and back slope until vegetation can take hold along bituminous sand-mat pavement on State Route 16, near North Platte, Neb. Nebraska Department of Roads & Irrigation finds hay cover to be effective and economical in sand hill area of state, where hay is plentiful.



RUGGED CEMENT BOXES designed by Keeley Bros. Contracting Co., East St. Louis, Ill., to meet specifications of Illinois Division of Highways, transport cement on Hug three-batch trucks serving paver on contract section of express highway between East St. Louis and Alton, Ill.



SPONGE-RUBBER-COVERED ROLLER, with hopper, is developed by National Paving Brick Association for applying to brick pavement surface, without entry into open joints, agent to facilitate removal of excess asphalt filler. Device, designed as substitute for spraying equipment, consists of wood cylinder 20 in. long and 6 in. in diameter covered with 1-in.-thick sponge rubber sleeve above which is mounted feeding hopper with squeegee blade at bottom. Tests were made with non-flowing separating agent consisting of 30 parts (by weight) of water, 50 parts of pulverized Ohio fire clay, 5 parts of calcium chloride to retard drying, 25 parts of No. 28-mesh sand to prevent slipperiness and 2 parts of Venetian red to match color of brick.

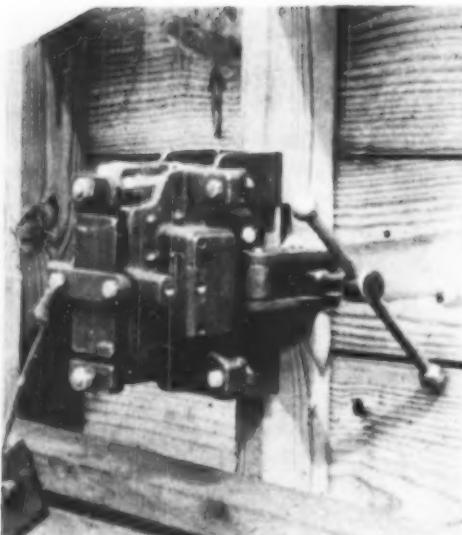


WORKING INSIDE BUILDING, tamping-leveling finisher lays two courses of bituminous resurfacing in 12 hr. on floor area of 46,780 sq.ft. in armory at East Liberty, Pittsburgh, Pa. Barber-Greene unit takes truck-delivered loads dumped into forward hopper of machine and spreads, tamps and finishes premixed cold-lay material containing slag aggregate $1\frac{1}{4}$ in. to $\frac{1}{4}$ in. in size for $1\frac{1}{2}$ -in. base course and natural Kentucky rock asphalt for $\frac{1}{2}$ -in. compacted thickness of top course. Each course is rolled. Allegheny Asphalt & Paving Co., contractor, Pittsburgh, completes entire job, including necessary excavation and blading prior to laying of base course, in about two weeks. Paved asphalt floor provides excellent playing surface for seven tennis courts laid out in armory for night use.

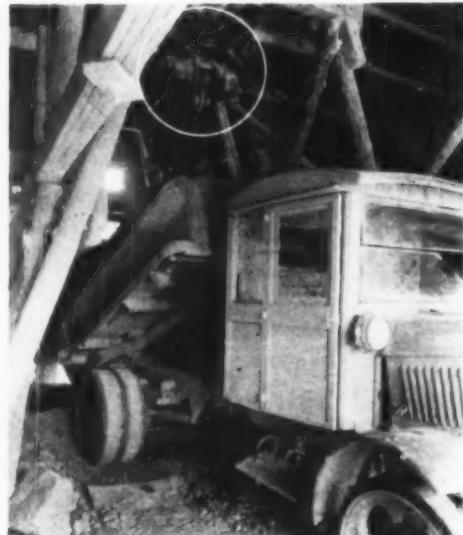
SMALL TOOLS ON CONSTRUCTION



1



2



3



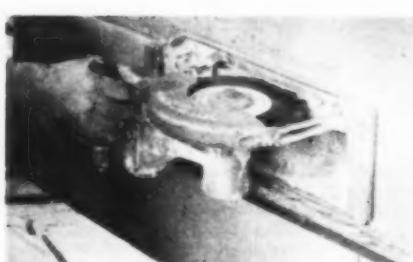
4



5



6



7

1 BOLT CUTTER snips wires tying bundles of reinforcing mesh delivered by truck to paving job of Mid-West Construction Co., Chicago, for Indiana Highway Department on relocated U.S. 40 between Brazil and Terre Haute, Ind. Heavy forged heat-treated straps keep cutting edges of Porter unit in line under heavy usage.

2 CONCRETE WALL FORMS ARE VIBRATED, externally, with this electrically powered unit (Sytron) attached to stud by quick-acting vise clamp. This type of pulsating electromagnetic vibrator is especially adapted for use on thin section wall forms carrying steel reinforcement, tunnel linings, and precast concrete products such as pipe and cribbing.

3 QUICK DUMPING of loaded motor trucks, delivering rock to crusher, is done by 5-ton bolt suspension type electric hoist (Wright), eliminating costly repairs to hydraulic lifts of fleet of 12 trucks.

4 SLED-MOUNTED ELECTRIC VIBRATOR meeting Indiana specifications straddles transverse joints and consolidates concrete around dowels as it is drawn back and forth across slab on paving job of Mid-West Construction Co., Chicago, building divided four-lane highway for Indiana Highway Department. Generator on finishing machine at left supplies power to electric motor of Jackson vibrator.

5 TUNNEL LINING JOINTS between rings of cast-iron segments in Queens-Midtown tunnel under East River, New York City, are calked with oval-shaped lead wire, weighing 8 oz. per foot, driven home by pneumatic hammers to prevent seepage. Walsh Construction Co. used more than 100 mi. of lead wire for calking purposes.

6 REMOVAL OF JOINT FILLER SHIELD from concrete pavement is done with special pair of tongs after Heltzel finishing machine has made pass over surface.

7 SLOTTING OF MORTAR JOINTS between stone wall slabs, prior to repointing and sealing of crevices, is done effectively and quickly by portable electric saw (Black & Decker) with Bakelite-bonded abrasive disk.



MOBILE LUBRICATION OUTFIT equipped with two three-wheel grease guns operated by air from compressor on truck injects grease into fittings at 120-lb. pressure. Truck traverses rough 7 1/4-mi. grading job of Central Pennsylvania Quarry Stripping & Construction Co., Hazleton, Pa., and greases earth-moving units on spot. Big trucks are greased at least once every 20 operating hours. All equipment on job has crankcase oil changed every 60 hr.



ONE-STOP SERVICE STATION gives complete on-the-spot service to excavating and hauling equipment on grading contracts of Guthrie-Marsch-Peterson Co., Chicago. Gasoline motor of light plant on truck drives compressor which maintains 150-lb. pressure in air receiver. Air line around truck bed is equipped with control valves for various services. Pressure is increased in volume grease guns by 40 to 1 ratio to 6,000 lb. In 550-gal. fuel tank, pressure is reduced to 15 lb. D. M. HOLIDAY (left), master mechanic, built service truck with aid of R. J. GALLAGHER, assistant master mechanic, standing beside bottom-dump trailer.



SERVICE TRUCK carrying hand-operated pump and volume guns does quick refueling and greasing job on tractor-bulldozer working in shovel cut of L. M. Hutchison, Mt. Union, Pa.

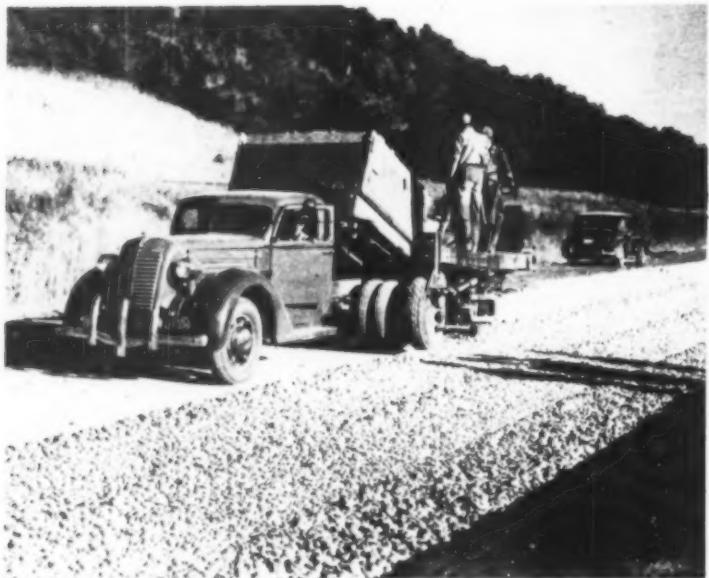


HAND-PUMPED VOLUME GUN greases tractor-scraper unit on contract of Dalton Bros., Inc., Paoli, Pa. Service truck carries fuel and crankcase oil.



TO INFLATE BIG TIRES of scrapers carrying up to 30-yd. heaped loads, C. J. Langenfelder & Son, Rosedale, Md., use small compressor (left) mounted in pickup truck (right).





BETWEEN ROLLED EARTH SHOULDERS, dump truck delivers aggregate to black-top paving machine which spreads stone in half-widths of roadway for 2½-in. penetration top on Hannibal Contracting Co.'s section.



OPERATING AS STONE SPREADER. Adnun black-top paver puts down 500 tons of aggregate for 2,250 lin.ft. of 2½-in. layer 22 ft. wide in 12 hr.



STANDING ON SECOND 4-IN. COURSE of waterbound base (left), which must check to surface smoothness of $\frac{1}{4}$ in. in 10 ft. are JOSEPH L. POHL (left), contractor, and GRANT D. WEST, assistant division construction engineer, Missouri Highway Department.



TAIL-DUMPING by trucks carrying slightly more than 5 tons per load distributes crushed limestone for 4-in. layer on contract of Joseph L. Pohl, who imports aggregates by rail. Hauling somewhat more than 2 mi. from railroad siding on this day, four trucks are adequate to take output of unloading conveyor. Construction schedule calls for completion of 1,000 lin.ft. of 4-in. waterbound base course in 16-hr. day of two 8-hr. shifts, requiring placement, manipulation and water binding of about 500 tons of material.



AFTER BLADING coarse aggregate for 4-in. base course with Caterpillar 12-ft. auto grader and rolling once with Fordson 5-ton roller, templet crew checks 2-in. crown and fills low spots with additional stone on Pohl section.

Asphalt Penetration ON WATERBOUND BASE

MISSOURI MACADAM AGGREGATE GRADATIONS	
SCREEN OR SIEVE	PER CENT PASSING
<i>Coarse aggregate for waterbound base</i>	
3-in.	100
2-in.	30-50
1-in.	0-15
<i>Screenings for waterbound base</i>	
1/2-in.	100
No. 10	30-85
No. 100	5-25
<i>Aggregate for penetration surface</i>	
2 1/2-in.	100
2-in.	90-100
1-in.	0-10
1/4-in.	0-5
<i>Cover material for penetration surface</i>	
1-in.	100
3/4-in.	75-100
1/2-in.	5-50
5/8-in.	0-5
<i>Aggregate for seal coat</i>	
1/2-in.	100
3/4-in.	85-100
No. 10	0-5

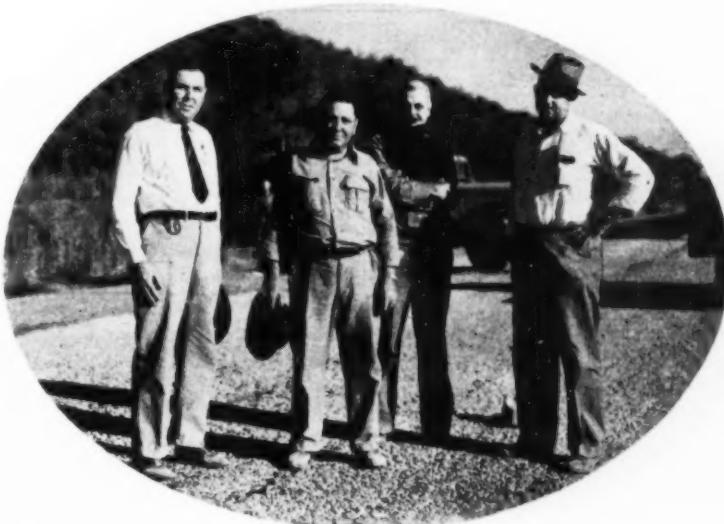
SUBSTANTIAL DESIGN and thorough workmanship marked the Missouri Highway Department's recent incursion into the field of macadam construction on 7.7 mi. of state route 45 relocation, paralleling the Burlington railroad line to Omaha at the foot of the Missouri River bluffs some 30 mi. north of Kansas City. Joseph L. Pohl, Nevada, Mo., and the Hannibal Contracting Co., Hannibal, Mo., built sections 3.7 and 4.2 mi. long, respectively, consisting of 8-in. waterbound base (on 1 1/2-in. compacted screenings) and 2 1/2-in. asphalt penetration top at a cost between \$15,000 and \$16,000 per mile. On the latter section, the Kissick Construction Co., Hickman Mills, Mo., performed roadway work under rental agreement with the contractor. Highway grade on both sections had been built under previous contracts.

Waterbound base was constructed to a width of 24 ft. and penetration mat to a width of 22 ft. For the Pohl contract, crushed limestone for both base and top was shipped in by rail. The Hannibal Contracting Co. produced crushed limestone locally for the waterbound base, but trucked in the crushed aggregate for the penetration course and armor coat. An accompanying tabulation gives stone gradations for various uses in the roadway.

Waterbound Base—Both contractors trenched the sub-grade for base construction and built the waterbound courses against rolled earth shoulders. On a compacted, crowned sub-



TWO 10-TON ROLLERS. Austin-Western gasoline-powered machine on shoulder at left and Buffalo-Springfield steam unit in distance, start rolling of coarse aggregate at roadway edges and continue rolling on parallel, overlapping tracks until crushed limestone is properly keyed and firmly fixed. As screenings, visible in foreground, are spread in successive applications, rollers continue to go over surface to work fine material into voids until all voids are filled.



LINED UP ON COVER STONE of asphalt penetration surface are (left to right): J. I. STELZER, project engineer in charge of both contracts for State Highway Department; O. A. LOTSPREICH, inspector; L. J. KISSICK, of Kissick Construction Co.; and T. T. GAMMON, superintendent, representing Cameron-Joyce & Co., original contractor for one section.

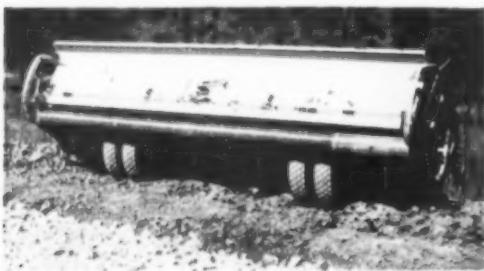


FOLLOWING APPLICATION of screenings by roll spreaders and brushing with broom drag, hand brooming assists in filling voids during dry rolling.



GRAVITY DISTRIBUTOR applies water to screenings after brushing and rolling have filled all voids in coarse aggregate. Two truck distributors supply water for binding on Pohl contract. Sprinklers apply water until macadam is saturated. Rolling follows sprinkling, more screenings being added when necessary. Sprinkling, rolling and sweeping continue until grout of screenings and water fills all voids and forms wave in front of roller wheels. At left is train of 25 hopper cars carrying stone for 2 days' operation on waterbound base.

TO APPLY SCREENINGS uniformly to surface of coarse aggregate, Joseph L. Pohl operates two Buckeye roll spreaders of this type (below). Screenings are rolled dry after each application.



grade, the road crews first placed a layer of screenings rolled to 1½-in. depth. Over this bottom course was spread a layer of coarse aggregate which was thoroughly rolled to 4-in. thickness both before and after being covered with screenings which worked down into the voids under the action of the rollers. Broom drags and hand brooms aided in distributing the screenings into the voids of the 4-in. course. Finally, the compacted, stabilized layer was waterbound by repeated applications of water from sprinkler trucks, followed by rolling. A second similar 4-in. layer was constructed on top of the first by the same methods, ending with the water binding.

Penetration Top — Following completion of the base, the contractors placed a 2½-in. asphalt penetration surface 22 ft. wide, shooting the 2½-in. stone layer with 1.4 gal. per square yard of 100 penetration asphalt at 350-375 deg. F. The penetration course was covered with 30 lb. per sq.yd. of cover stone which was sealed with 0.4 gal. per square yard of 85-100 penetration asphalt at 350-370 deg. Before rolling, the road crews spread 18 lb. per square yard of seal coat aggregate on the cover material. Roadway shoulders were oiled to seal the entire surface against moisture.

Administration — For the Missouri State Highway Department, C. W. Brown is chief engineer and J. J. Corbett is engineer of construction. The macadam pavement was built under the general direction of W. H. Burgwin, division engineer, W. J. Groves, division construction engineer, and Grant D. West, assistant division construction engineer, Kansas City, Mo., with J. I. Stelzer, project engineer, in charge of both contracts.

Joseph L. Pohl, contractor, Nevada, Mo., directed the work on his section. The contract for the second section had been assigned to the Hannibal Contracting Co. by Cameron-Joyce & Co., Keokuk, Iowa, represented on the job by T. T. Gammon, superintendent. L. J. Kissick, of the Kissick Construction Co., supervised roadway operations.



ON TOP of 2½-in. penetration macadam surface which has been covered, immediately following application of asphalt, with 30 lb. per square yard of cover stone, Kissick Construction Co., performing roadway construction under rental agreement with Hannibal Contracting Co., shoots seal coat of 0.4 gal. of hot asphalt with Littleford 880-gal. pressure distributor.

PORTABLE BELT UNLOADER transfers stone from hopper cars to trucks. Capacity of siding, limited to thirteen cars, establishes volume of one day's operation.



SHOULDER DRAINS are excavated and backfilled with crushed stone to carry water away from subgrade and waterbound base.



AT LOADING STATION for pressure distributor, roadway contractor utilizes Cleaver-Brooks portable boiler plant equipped with special hot blast unit to heat asphalt in tank cars to proper temperature for application on road at 350-375 deg.



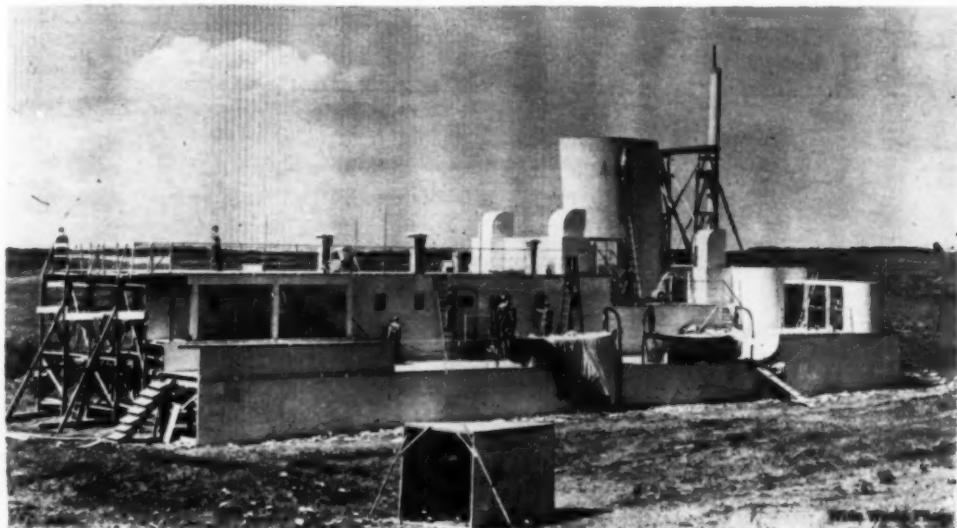
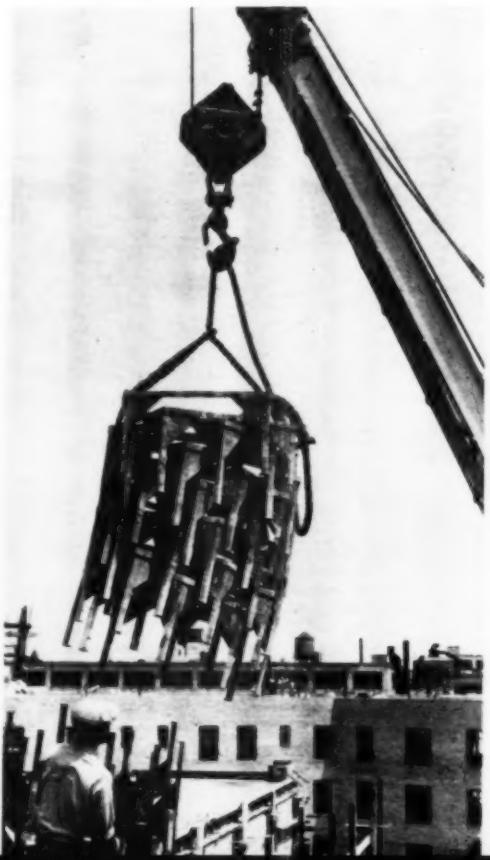
COLOR VISUALIZATION for home owners and builders is made possible at color center, recently established in Cleveland, Ohio, by The Glidden Co., paint manufacturer, to show painted small-scale models of houses on revolving stands. Comprising 400 models in 1,000 color combinations, exhibit enables consumer to study decorative effects of both interiors and exteriors of houses to which paint has been applied. Model houses are constructed of interchangeable panels which can be assembled in special color schemes to guide purchasers of paint.

POB oddities



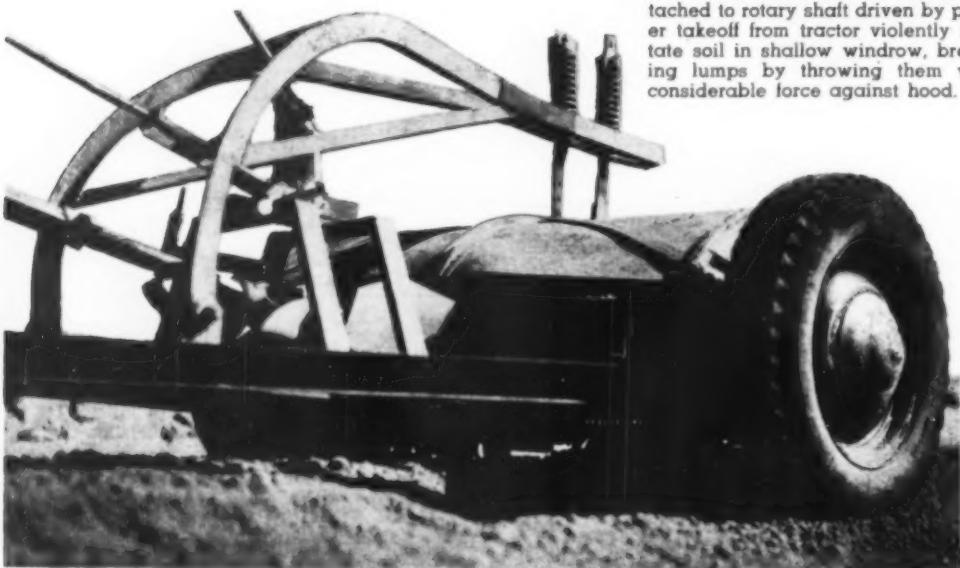
Wide World Photo

"DROP IN ANY TIME," says Ben Dudley, seated in rowboat swinging at end of rope below Eads Bridge, St. Louis, as he keeps watchful eye on fourteen painters whom he is delegated to save in case any of them should take a plunge into Mississippi River.



RUNWAY HORSES (left) take fast drop as concrete crew of Corbett Construction Co. hooks bundle of steel chairs, used under runway panels, to load line of long-boom crane for quick trip to ground after completing roof pour on one of 26 six-story apartment buildings in Queensbridge Houses for New York City Housing Authority.

NO WILD WAVES will ever trouble peaceful anchorage of this yacht being erected by movie makers at Cinecitta, Italian motion picture center near Rome, to provide background for close-up shots in ocean-going scenarios.



48 ROTATING SPRING TINES attached to rotary shaft driven by power takeoff from tractor violently agitate soil in shallow windrow, breaking lumps by throwing them with considerable force against hood.

NEBRASKA TESTS *Soil Processing* WITH CEMENT, ASPHALT EMULSION AND TAR

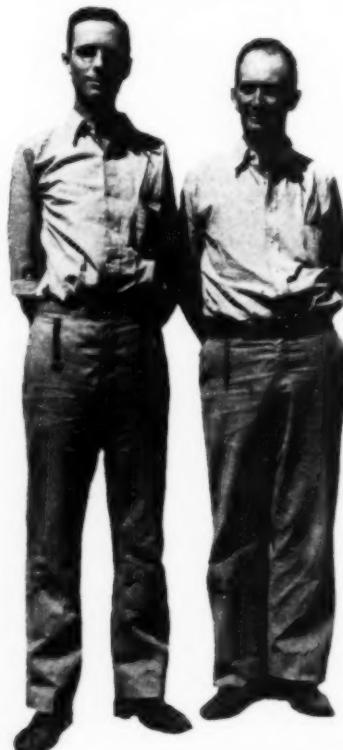


ROTARY TILLER churns dry silt-clay soil, pulverizing it for later mixing with sand windrowed on shoulder at left. Soil mixture for soil-cement processing consists of 60 per cent natural silty clay soil and 40 per cent sand trucked some 7 mi. from waste pile at old gravel pit.

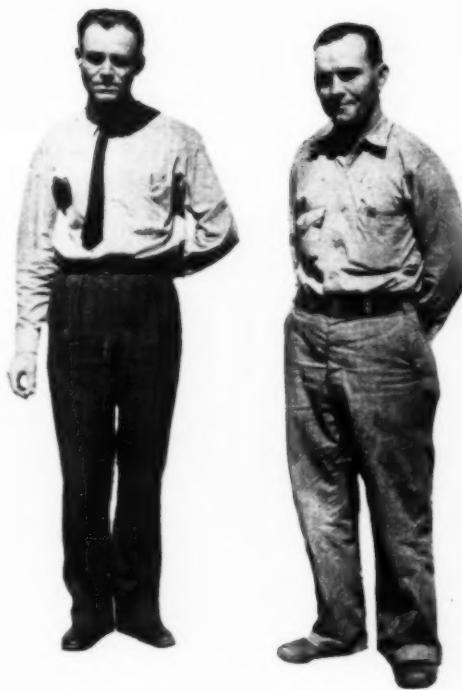
TO COMPARE RESULTS OBTAINABLE from three types of processed soil roads built with portland cement, asphalt emulsion and tar, the Nebraska Department of Roads and Irrigation set up a 14-mi. project, involving approximately equal mileages of the three materials, on State Route 33 east of Crete. The Inland Construction Co., Omaha, Neb., built 5 mi. of soil-cement road 5 in. thick extending west from this route's junction with U. S. 77, and Lee & Johnson, Inc., Sioux City, Iowa, put down the remaining 9 mi. in equal sections of asphalt emulsion and tar, a major part of each section being 5 in. thick and a minor part 4 in. thick. For 24-ft. roadway 5 in. thick on all three sections, the cost was \$7,000 per mile. On the two bituminous sections, 4-in. thickness was put down for \$6,000 per mile.

All three types were placed on an existing roadway which had a traffic-bound gravel surface on silt-clay sub-grade. Methods of construction for the divergent types afford interesting comparisons.

Equipment and procedure employed in construction of the 5-mi. soil-cement section followed recommended practice developed in recent years for this type of work. One equipment feature which distinguished the job from many soil-cement projects was the use of rotary tillers, supplanting cultivators, to pulverize clay soil and assist in mixing soil-cement during dry- and wet-mix operations. Each of two Seaman rotary tillers on the job was equipped with 48 spring tines attached by double torsion springs to a rotary shaft driven by power take-



FOR NEBRASKA, work on three sections is directed by D. C. ERICKSON (left), project engineer, Bureau of Roads and Bridges, Department of Roads and Irrigation. FRED MORGAN, superintendent, is in charge of soil-cement construction for Inland Construction Co., Omaha, Neb.



FOR UNCLE SAM, experimental project is inspected by J. R. SORENSEN (left), associate highway engineer, U. S. Public Roads Administration. J. M. GRIBBLE, superintendent, builds bituminous-processed soil sections for Lee & Johnson, Inc., Sioux City, Iowa.

off from a farm tractor which pulled the unit. The rotating spring tines worked a strip 4½ ft. wide, throwing the material up against a covering hood with sufficient force to break lumps. A substantial carrying shoe carried the pulverizing assembly at the same depth regardless of the position of the chassis wheels.

By adding 40 per cent sand to the natural silt-clay soil available alongside the project, materials engineers improved the gradation and density of the mixture, with resultant reduction in cement and in optimum moisture content. Natural soil required about 14 per cent cement for a properly designed soil-cement mixture. Improving the gradation by addition of 40 per cent sand, hauled some 7 mi. from the west of the project, reduced the cement requirement to 10 per cent. In addition, less water was needed for optimum compaction, and the work required for pulverization during the wet-mixing period was correspondingly decreased.

Pulverizing with Tillers

Silty clay furnishing 60 per cent of the soil mixture was spread and pulverized in four lifts, a single rotary tiller completing one lift for 2,000 ft. of road in 2 to 4 hr. Working in conjunction with the tiller, a diesel motor patrol bladed the material into a windrow after each pass of the pulverizer. After pulverizing of the four lifts had been completed, sand providing the remaining 40 per cent of the soil mixture was bladed into the roadway from its windrowed position on the shoulder for mixing with the clay.

For dry mixing of soil and soil-ce-



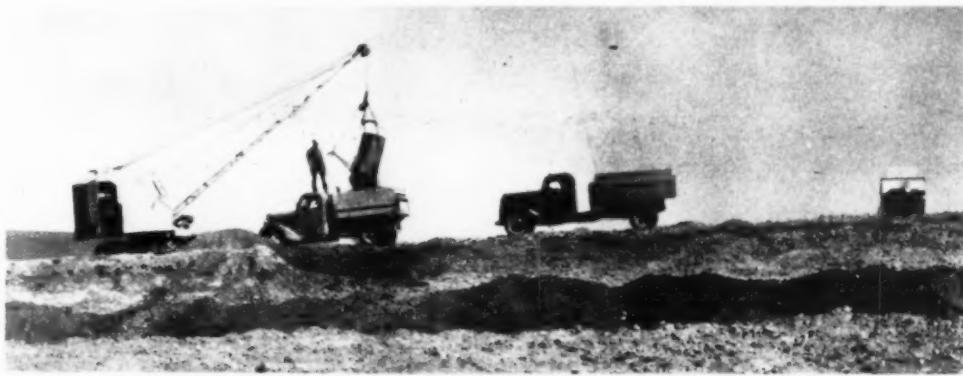
ON DRY MIXING AND WET MIXING of soil-cement, rotary tiller works in combination with tractor-drawn gang plows, harrows and cultivators to produce uniform mixture of portland cement, soil and water.



CLOSELY FOLLOWING WATER APPLICATION during wet-mixing operation, spring-tooth harrow and orchard cultivator start blending moisture into soil-cement mixture.



TRAILER PRESSURE DISTRIBUTOR hooked to rear end of 2,000-gal. water tank carries 2½-in. centrifugal pump to assure uniform water application from 12-ft. spray bar. Motor patrol pulling water truck carries tachometer device on blade to guide operator in applying water at uniform rate.



NATURAL CLAYEY SILT for soil-cement section is excavated by ½-yd. dragline alongside project

ment, and for wet mixing of moistened soil-cement, the contractor had another rotary tiller, a spike-tooth harrow, a spring-tooth harrow, a spring-tooth cultivator with 4-in. duck-foot teeth, and two four-bottom 14-in. gang plows. Several farm tractors and 40-hp. gasoline track-type tractors operated this equipment. For blading materials during the various stages of construction, the job was equipped with two

Caterpillar diesel motor patrols and two Austin-Western gasoline patrol units.

Dry Mixing

Soil and sand were mixed by gang plows and blade patrols. When soil mixing had been completed, the soil windrow was flattened to receive cement distributed 100 bags to the station in five rows. About 1½ hr. sufficed to distribute cement for a 1,200-ft. section.

After being dumped from the sacks, the cement was spread over the surface of the flattened windrow with a spike-tooth or spring-tooth harrow, preparatory to dry mixing.

A cultivator, rotary tiller and gang plows completed dry mixing of soil and cement on a 1,200-ft. section in another 1½ hr. The rotary tiller and cultivator first worked the section two or three

(Continued on page 110)



FINAL SURFACE COMPACTION on all soil-processed sections is accomplished by pneumatic-tire rollers carrying tire pressure of 45 lb. per square inch drawn by farm tractors. This roller is traveling on subgrade alongside windrow of asphalt emulsion-soil mixture on its way to take up rolling of material that has been compacted to within 1 in. of finished grade by sheepfoot rollers.



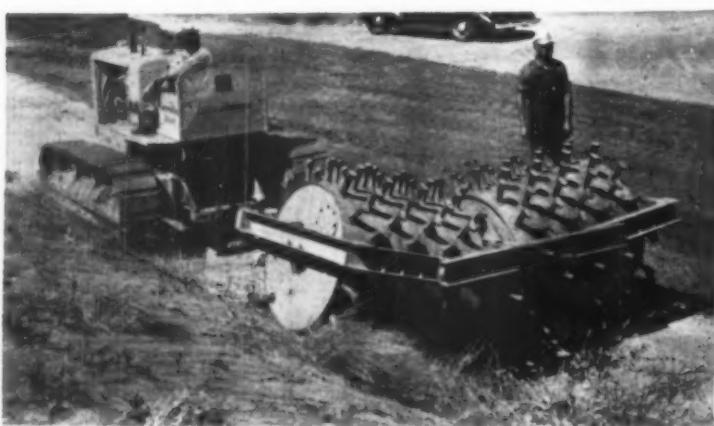
TRAVELING MIXING PLANT picks up continuous windrow of soil for 5-in. roadway mat 24 ft. wide, adds metered quantities of bitumen and water, mixes material in twin pugmill and deposits unbroken windrow of completed mixture on roadway, ready for spreading and compacting.



CONTINUOUS FLOW of soil mixed with asphalt emulsion issues from twin pugmill mixer of traveling plant. Uninterrupted progress of mobile mixing apparatus completes mixture for 24-ft. roadway 5 in. thick at rate of 1 mi. in 40 hr. on soil-asphalt emulsion and 1 mi. in 30 hr. on soil-tar.



TANK TRAILER attached to traveling plant supplies water for mixing. Mixing plant incorporates own tank for bituminous material. Under hopper at upper right is belt feeder which carries measured quantity of soil to spray bars and pugmill mixer.



ON ALL THREE TYPES of processed soil construction, initial compaction of completed mixture is obtained with dual articulated sheepfoot rollers similar to this unit, on shoulder alongside emulsified asphalt section.

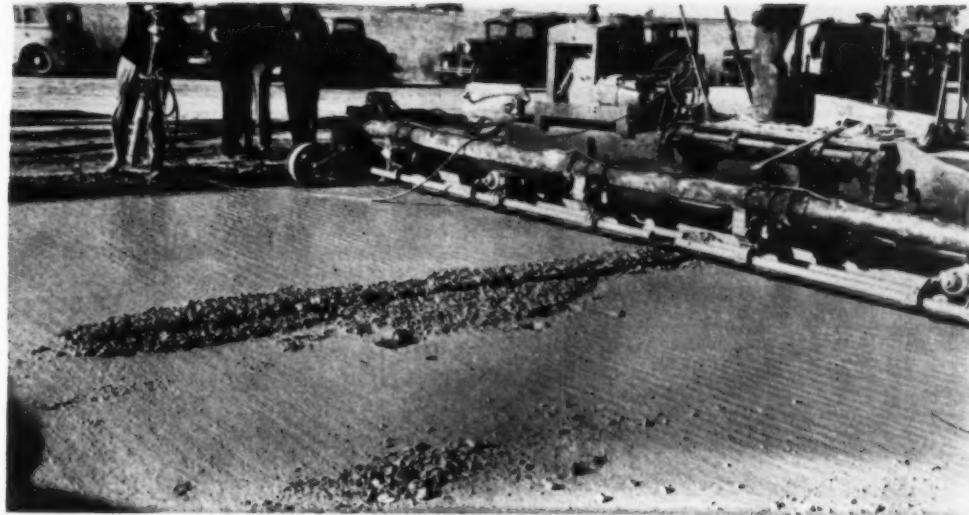


AUTO GRADERS serve for shaping subgrade, doing preliminary soil mixing and striking off final mixture on all three sections. These two patrols are shaping asphalt emulsion-soil mixture during sheepfoot compaction.

Vibratory Paving Tubes SAVE CEMENT IN OKLAHOMA

ELECTRICALLY POWERED VIBRATORY PAVING TUBES flexibly mounted on a wheel carriage in front of a gasoline-engine-driven finishing machine produced a plastic consistency in dry, lean-mix concrete placed at the rate of 770 cu.yd. in 8 hr. by two 27E pavers on a \$340,000 contract of the Standard Paving Co., Tulsa, Okla., which built two 24-ft. divided lanes for 7.157 mi. west from Oklahoma City on U.S. 270 under the direction of the Oklahoma State Highway Commission. At the rate of progress established by the two pavers, the Jackson vibratory tubes and Jaeger finishing machine completed 1,600 lin.ft. of 24-ft. pavement in an 8-hr. day, an average of 200 ft. per hour. Concrete slump ranged from $\frac{1}{2}$ in. to 1 in., never exceeding the latter figure, and the cement factor was held to 489 lb. (5.2 sacks) per cubic yard.

As indicated by an accompanying photograph, two pairs of parallel tubes, $2\frac{1}{8}$ in. O. D., were flexibly suspended from a 5-in. pipe supported on a wheel frame attachment at the front of the finishing machine. Each pair of tubes vibrated half the slab. The rear tube



VIBRATORY PAVING TUBES. flexibly suspended in pairs from pipe carriage attachment at front of finishing machine, transform dry lean-mix concrete to workable consistency for producing creamy mortar finish under reciprocating screeds of finisher. Slab has been trenched out on center line to receive 6-in. channel forms for permanent white cement traffic stripe, and tubes have been raised for second pass of finishing machine. Vibratory spade, at left, is used in puddling special paving sections and along forms on this job.

of each pair, operating close to the finisher screed, was shortened to provide clearance for the wings of the reciprocating screed. Mounted on each pair of tubes and rigidly attached to them by brackets was a heavy-duty vibratory motor. A gas-electric generator unit on the finishing machine supplied power to the two electric motors and to a manually operated electric vibratory spade used for puddling concrete by internal vibration along side forms and in special paving sections such as crossovers between the two roadways.

Cement Saving—Utilizing the allowable 10 per cent overload, the mixers turned out 29.7-cu.ft. batches. Each batch contained 2,517 lb. of gravel, 1,231 lb. of sand and 538 lb. of cement. Water content per batch was about 24.2 gal., although the amount of water was var-

ied from time to time to keep the consistency as uniform as possible. By reducing water content to attain a low water-cement ratio, the engineers obtained required concrete strength at a saving in cement estimated to total \$10,080 for the entire job.

A heavy roll of concrete, carried in front of the finisher screed over the vibratory tubes, slowed down finisher progress somewhat, but the vibrating and finishing equipment was able to keep up with the two pavers, creating a dense mixture of workable consistency and imparting a good mortar finish to the slab. The contractor completed the job several days ahead of schedule.

Design and construction of the project were carried out by engineers of the Oklahoma Highway Commission under Van T. Moon, chief engineer.



HEAVY ROLL of dry concrete submerges vibratory paving tubes as it piles up in front of vibrating and finishing equipment.



WORKABILITY of concrete improves as dry mixture feels effects of vibrating tubes. Note how harsh mixture ahead of tubes is transformed to plastic mass as it approaches front screed of finisher

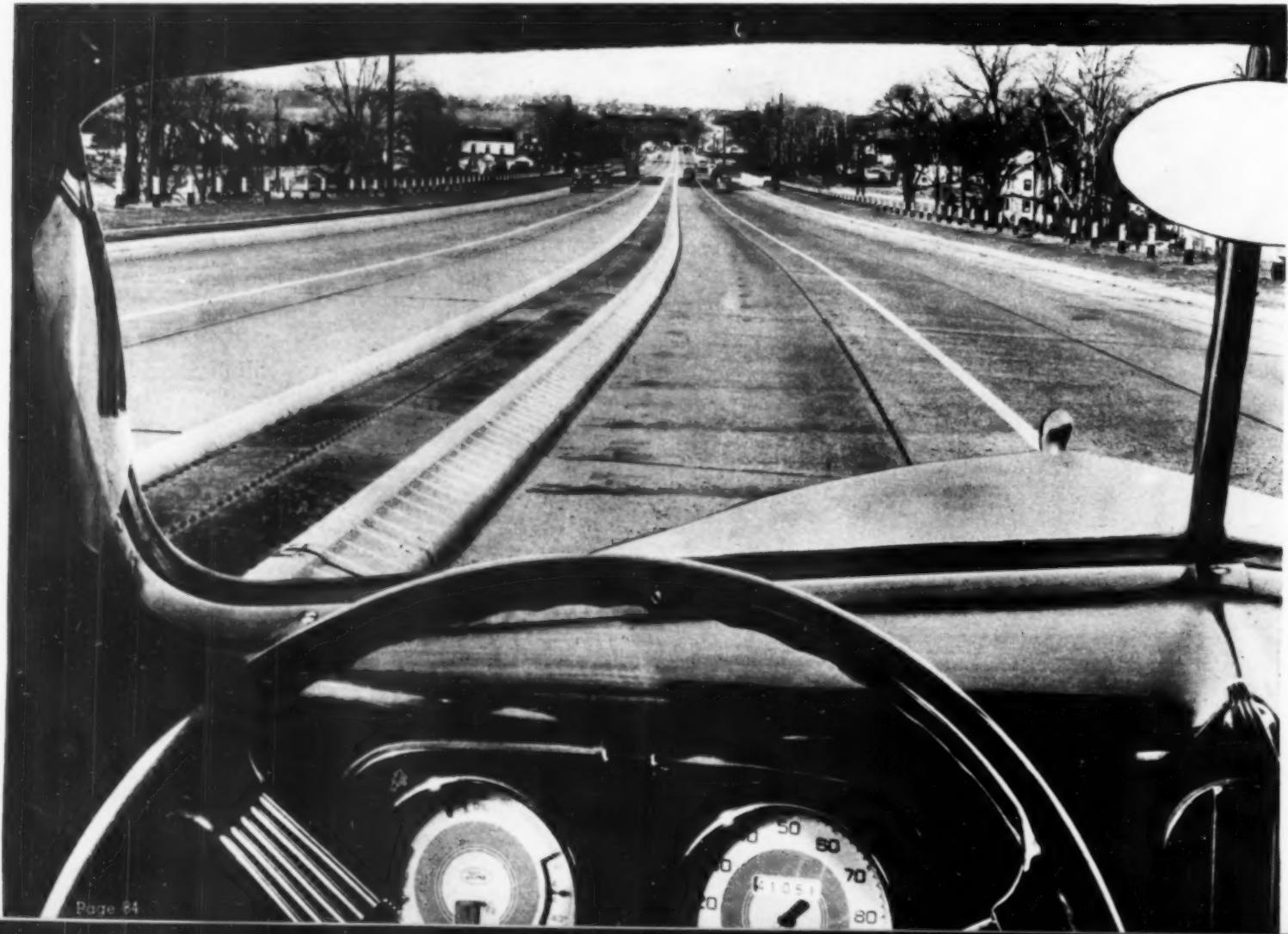


Reflecting Curbs
OF WHITE CEMENT
GUIDE

Night Traffic

NIGHT AND DAY VIEWS (above and below) of reflecting curb through automobile windshield of car on Route 4 in Bergen County, N. J. Use of white cement and reflecting faces on precast curbing along center island of divided highway results in high visibility and safe driving at night.

EDITOR'S NOTE—The two illustrations on this page are composite photographs made, not to reproduce all detail precisely, but rather to illustrate the general appearance, from the driver's seat of a car, of the roadway with white cement curb under day and night conditions.



PRECAST CURBS OF WHITE CEMENT, designed with sawtooth faces containing a series of closely spaced depressed panels to produce a continuous band of reflected light from automobile headlights, are being installed on state highways in New Jersey to promote safe driving at night by clearly marking the limits of center islands and outer edges of divided roadways. Tests indicate that the effectiveness of curbs of this type increases on rainy nights when visibility ordinarily decreases. While a film of water flowing over the reflecting faces of the curb cuts the angle of diffusion to a narrow range it correspondingly increases the intensity of reflection.

Although both precast and cast-in-place curbing is used, H. W. Giffin, engineer of surveys and plans for the New Jersey Highway Department, reports that the precast type gives better results in the construction of slant-faced curb because of the smoother and denser concrete surfaces produced and also because the critical angle of the reflecting faces is accurately controlled by the mold.

The curbs are cast in lengths up to 9 ft. and in widths, originally, of 18 in., a dimension which was later reduced

(Continued on page 116)



COMPLETED CENTER ISLAND built with precast white cement concrete curbing on Route 4 in Bergen County, N. J. Note depressed panels and ribs cast in face for light reflection at night.



FORMS FOR PRECASTING curbs are made of concrete with bottoms formed to produce depressed panels for reflecting light.



WHITE CEMENT CONCRETE is poured into forms and spread to form surface lining which is backed up with gray cement concrete, containing steel reinforcement, forming body of slab.



REMOVED FROM MOLDS after 24 hr., precast curb units are placed on steam table, wetted every 2 hr. and cured for 4 days.

WITH CARRYING TONGS (below) four-man crew sets curb units in place for center line dividing strip on paved highway.



DELIVERY OF CURB UNITS (below) to job is done by motor truck which is unloaded by truck crane with aid of rope slings from I-beam yoke.

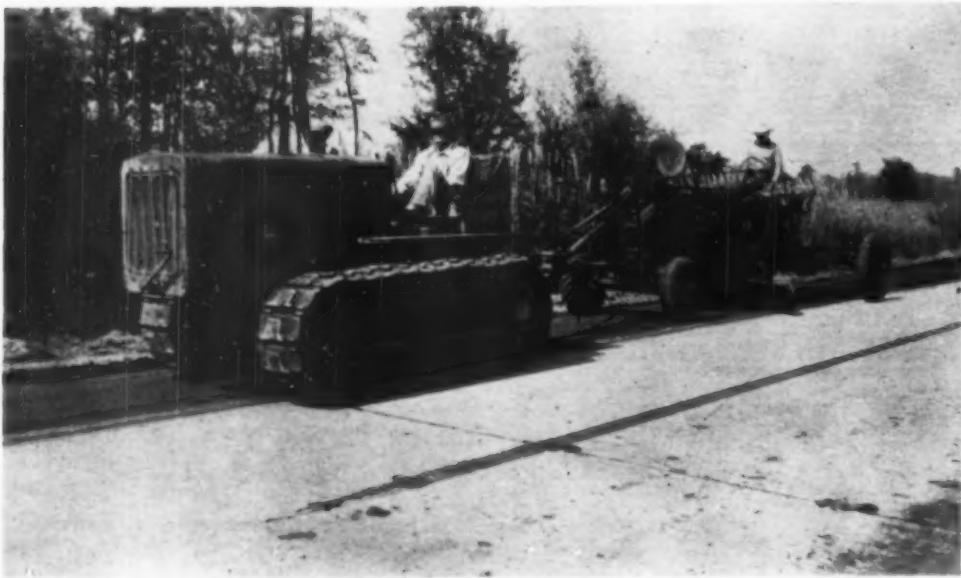




PRIOR TO TREATMENT with application of asphalt, road shoulder is scarified and pulverized to uniform depth.



ASPHALT-STABILIZED MATERIAL is produced at central mixing plant.



FINISHING OPERATION on asphalt-stabilized shoulders is performed by tractor-hauled blade grader.

Road Shoulders MADE SAFE AT MINIMUM COST BY BITUMINOUS TREATMENT

By S. J. MATHIS
Assistant to Maintenance Engineer,
South Carolina Highway Department

PRIOR TO 1930 practically all of the hard surfacing on the state highway system in South Carolina was a rigid base pavement 18 ft. wide, with earth shoulders. This type of construction met the traffic requirements very well until the early '30's when traffic volumes and speeds increased to a marked degree. With these increases, maintenance of safe earth shoulders on paved roads became expensive.

To meet this condition on 2,000 mi. of paved state roads the department sought some satisfactory method of providing safe shoulders at a minimum cost. One of the methods of attacking this problem, begun about 1930, was the application of a bituminous surface treatment on a shoulder sufficiently wide to provide safety from accidents caused by vehicles running off the pavement on to a soil shoulder rough from erosion. The first experiments consisted of applying bituminous surfaces on a 4-ft. wide selected soil shoulder. The existing shoulders consisted primarily of a natural mixture of weathered sand and clay, known locally as topsoil. These topsoil shoulders were properly shaped and cleaned of vegetation and covered with a double bituminous surfacing similar to the type used as road surfacing at that time. Other experiments consisted of a surface treatment on earth type bases stabilized with asphalt or tar. Base material



CORRECT SLOPE IN FINISHING OPERATION is obtained by use of tell-tale device mounted on grader blade.

stabilized in this manner, however, was used only where satisfactory local materials within economical haul limits were not available.

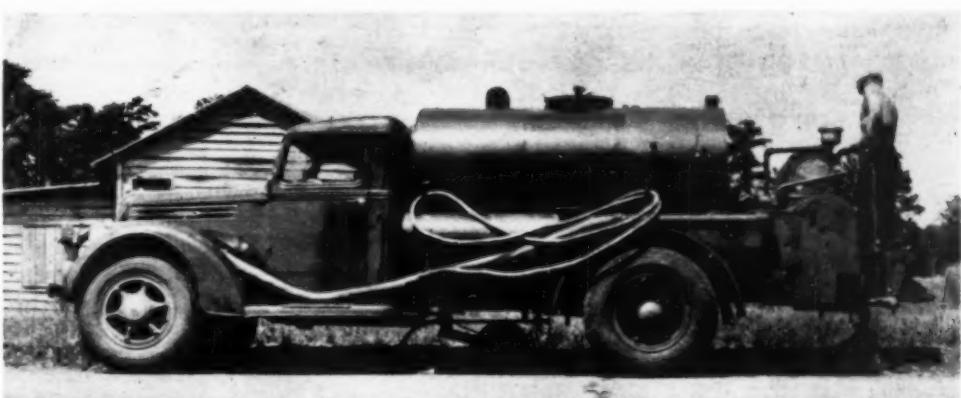
The early experiments proved satisfactory. Shoulder maintenance costs were materially reduced and road conditions made much safer for traffic. In fact, the surface treatment of shoulders proved so satisfactory and necessary that in 1937 the state highway department set out on a program to surface-treat the shoulders of all paved roads in the state highway system less than 20 ft. in width, with the ultimate aim of treating the shoulders on about 2,000 mi. of paved roads.

At present two types of treated shoulders are being constructed in South Carolina: A double bituminous-treated shoulder on a selected soil base, and an inverted penetration treatment on a stabilized base. In South Carolina the state is separated into areas where the local soil found is of similar type. In the western and central parts topsoil and sand-clay materials are abundant and the type of shoulder treatment found is generally that with sand-clay or topsoil base, with a double bituminous surface. In the southern and northeastern parts of the state the shoulder treat-

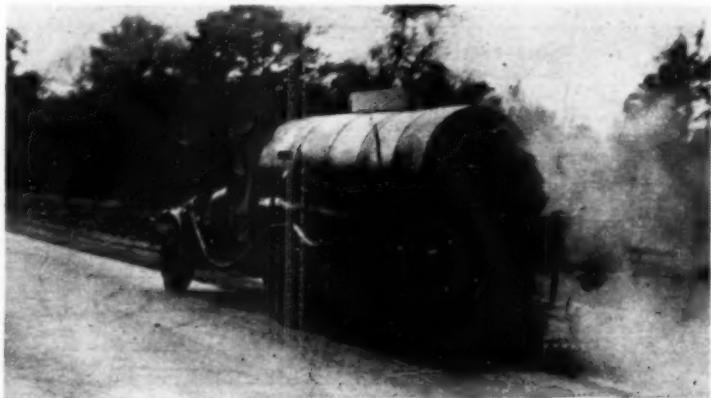
(Continued on page 128)



RUBBER-TIRED ROLLER compacts stabilized road shoulders.



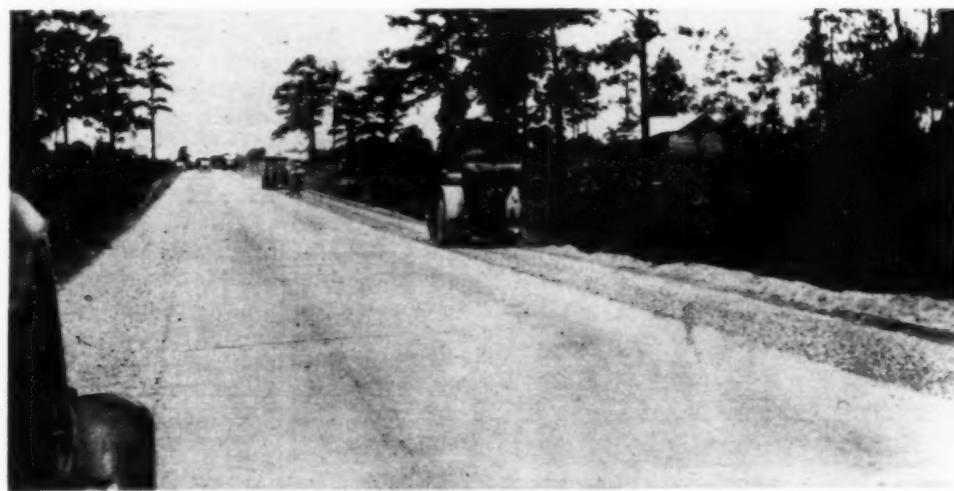
TAR IS APPLIED to top-soil shoulders by pressure distributor.



IN DOUBLE BITUMINOUS TREATMENT hot asphalt is applied by pressure distributor at rate of $1\frac{1}{2}$ to $2\frac{1}{2}$ gal. per square yard.



COARSE AGGREGATE is spotted for spreading in double bituminous treatment to provide wearing surface on shoulder.



THREE-WHEEL ROLLER compacts coarse aggregate in double bituminous treatment.



HARROW MOUNTED UNDER GRADER is used in mixing stabilized bases for shoulders.



TRUSSSED 20-FT. TEMPLET, equipped with compensating dollies riding on wooden box rails, strikes off bedding course for half of roadway at a time

Brick Paving Job ON LONG VIADUCT EMPLOYS *Novel Expansion Joints*

By F. S. ROSEN.
Bridge Superintendent
Wayne County, Mich.



PRIME COAT of cut-back asphalt, brushed on concrete, prepares base for spreading of bituminous sand mastic cushion.



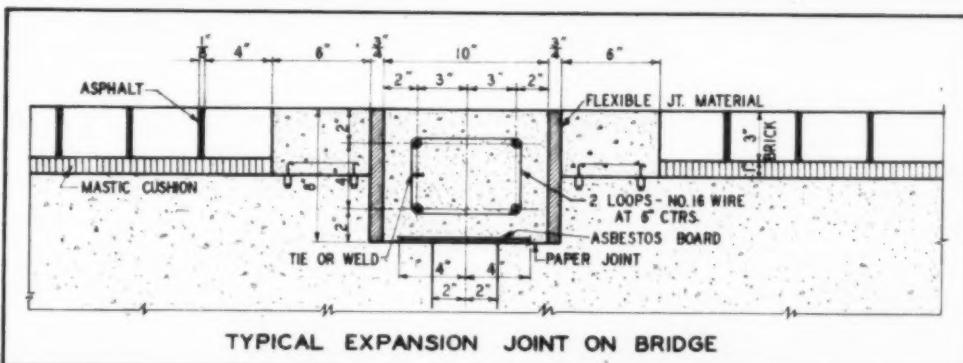
ROLLING ON BOARDS distributes weight of roller over larger area and assures more uniform bedding of brick in mastic cushion.

A 40-FT. BRICK PAVEMENT placed by the Board of Road Commissioners of Wayne County, Mich., early in the summer of 1939 completed construction of a 2,000-ft. concrete viaduct carrying West Road in the Village of Trenton over eight tracks of four railroads leading into Detroit. Because the job was a county-sponsored WPA project, there had been considerable doubt as to the results which could be obtained with relief labor on brick paving, but a combination of sufficient equipment and sponsor-furnished skilled supervision resulted in work of excellent quality at a reasonable rate of progress. It was found that under such conditions the morale of the crew and the resultant daily output were well above those usually obtained from relief labor. In addition, an extremely low accident frequency was experienced.

Vertical fiber 3-in. brick, lugged both sides and ends, was selected as a sur-

facing material to eliminate damage from salt or calcium chloride used for ice removal in the winter and to provide good traction on grades of about 4 per cent. Prevailing methods of asphalt-filled brick paving were followed with introduction of some new features, particularly at expansion and articulating joints in the bridge section and at sub-base joints in the approaches. The design paid particular attention to the removal of water which usually accumulates under brick paving at the curb line over a bridge structure. A simple remedy was developed to avoid cumulative deterioration in the concrete deck from this source.

Materials Handling — Materials were shipped by rail from the plants direct to a construction yard at the site. Mastic



TYPICAL EXPANSION JOINT ON BRIDGE

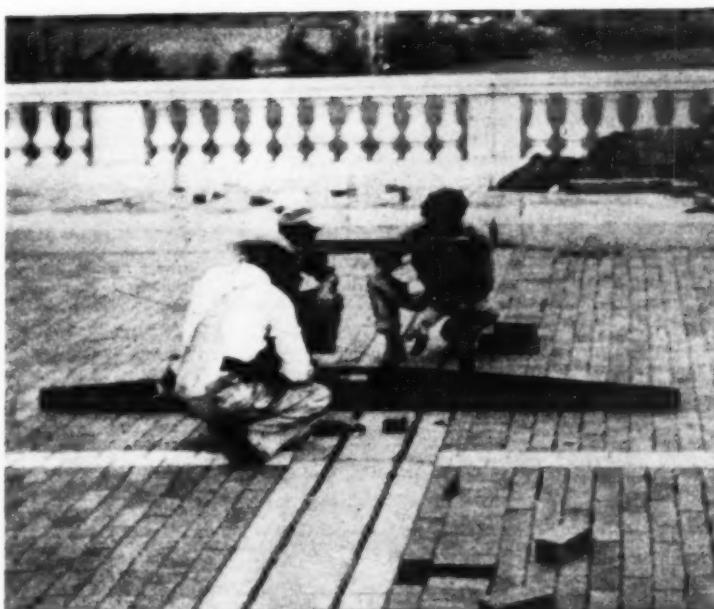
bed material composed of 96 per cent sand and 4 per cent asphalt was mixed in a portable plant located in the yard. This plant dried and heated the sand to 100 deg. F., weighed the ingredients, and pug-mixed the materials. Sand was unloaded by crane and bucket.

Brick were received from the Metropolitan Paving Brick Company in gondola cars and were unloaded on to four-wheel trailers which were moved by dump truck, thus permitting all handling of brick and mastic bed material

(Continued on page 102)



PRIOR TO POURING FILLER, workmen correct irregularities in surface and cull any defective brick.



BRIDGE EXPANSION JOINT has 4-in. opening covered by concrete block with pre-molded elastic material between it and adjacent concrete headers. Concrete blocks and headers are colored to resemble brick pavement and to distinguish them from cream-colored traffic-marker brick.



AFTER BRICK SURFACE (left) has been sprayed with separating agent, workmen pour hot asphalt joint filler from hand pots.



SEPARATING AGENT on top surface of brick enables scrapers to peel excess asphalt readily from pavement.



TO BE ELECTED this month to presidency of American Society of Civil Engineers, JOHN P. HOGAN, vice-president and engineering consultant of New York World's Fair, will take office during the society's annual meeting in New York City, Jan. 17-19. Hogan has served for two years as vice-president. He is a member of firm of Parsons, Klapp, Brinckerhoff & Douglas, consulting engineers, New York.



CARRYING TO COMPLETION difficult shield tunneling of twin tubes for Queens Midtown tunnel under East River, New York City, JACK MACDONALD, general superintendent, directs hazardous project for Walsh Construction Co., contractor.



ON BELT PARKWAY, New York City's new six-lane 31-mi. circumferential superhighway, described elsewhere in this issue, JOSEPH MELZER (right) president, National Excavation Corp., which handled several bridge building and paving contracts on project, confers with L. E. ANDREWS, regional highway engineer of Portland Cement Association.



AS CHIEF ENGINEER of Massachusetts Department of Public Works, R. N. COBURN determines engineering policies governing construction of highways and bridges in state system.



ELECTED PRESIDENT of American Association of State Highway Officials at fall meeting, HENRY F. CABELL, Oregon highway commissioner, heads Association's work for this year.

Present and Accounted For — A Page of PERSONALITIES



FINAL POUR OF CONCRETE on main 242-mi. line of Colorado River aqueduct, built by Metropolitan Water District of Southern California, is made in transition structure at west portal of San Jacinto tunnel by crew consisting of (left to right): Construction Superintendent ED. NOON and Shifters BEN MARKIN, VIC TRINE, J. P. FAUBION, J. P. WEBER and AL STOKER.

CONSTRUCTION EQUIPMENT NEWS

(ALL RIGHTS RESERVED)

Review of Construction Machinery and Materials
for JANUARY, 1940



ELEVEN RE-MIXING CONCRETE SPREADERS equipped with reversible spreading screws and adjustable strikeoffs are in use on Pennsylvania Turnpike to re-mix, spread and strike off base ready for laying steel and top ready for finishing machine. Use of these spreaders said to eliminate segregation and "bottleneck" caused by hand shovels in pit as spreader re-works material and spreads it at rate well in excess of 100 cu.yd. of 1-1½-in. slump concrete per hour, permitting 34E dual-drum paver to operate at full capacity. More uniform texture of slab also is claimed—Jaeger Machine Co., Columbus, Ohio.



NEW ROAD FINISHING MACHINE introduces number of improvements and distinctive features: (1) Unit transmission accommodates all functions of machine, both as to traction and screed drives—4-cylinder, 24-hp. gasoline engine provides power and drives through compact and fully automatic transmission with very little power loss; (2) speed of screed stroke is synchronized with finisher's speed of forward travel—faster machine travels forward, faster screeds stroke; (3) structure extensions to screed may be

added in field and change of width of machine also is made easier; (4) 18-in. forward extension on wing eliminates spillage of concrete over forms and reduces unit pressure and thrust on forms; (5) spring shock absorbers furnished for both screeds, preventing "weaving" of finisher and distortion of road forms; (6) conveniently located controls. Machine has been tested on Pennsylvania Turnpike and production rate of 250 lin.ft. per hour of 12-ft. slab for 8 hr. has been attained.—Blaw-Knox Co., Pittsburgh, Pa.

Monotube Method

MEETS
TURNPIKE
REQUIREMENTS

● That's why Tapered Steel Monotubes were used for EIGHT OUT OF THE NINE BRIDGES that required piling on the Pennsylvania Turnpike. Results verified the confidence placed in them, too. One contractor reported that they frequently drove 45 to 50 Monotubes in 8 hours. Driving was handled with cranes already on the job. All contractors* were well pleased with the speed with which the Monotubes were driven, concreted and made ready for the footings.

Time savings and the Monotube Method of pile construction are synonymous. Get the complete facts now! Write for Catalog No. 68A.

*Connell & Laub, Inc., Dayton, Ohio—County Construction Co., Pittsburgh, Pa.—Guthrie, Marsch & Peterson, Chicago, Ill.

THE UNION METAL MANUFACTURING CO.
CANTON • • • OHIO

View showing Monotube installation for a typical Turnpike bridge job. Every other pile on inside of footer is a batter pile.



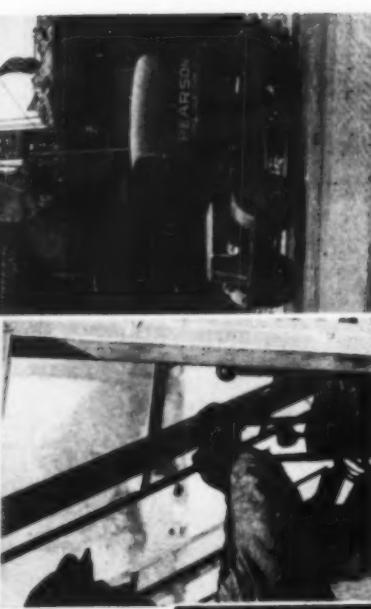
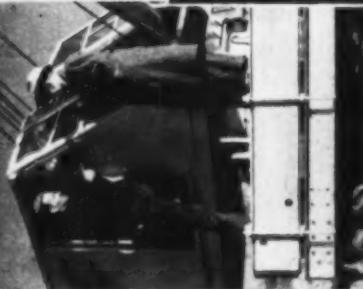
ROAD-SHOW EVERY DAY

where MICHIGAN TRUCK SHOVELS-CRANES are on the job!

"Yes Sir! . . . Our costs prove there are real savings in every MICHIGAN bucketful!"



"The day's last load's as easy as the first -- with MICHIGAN AIR CONTROLS!"

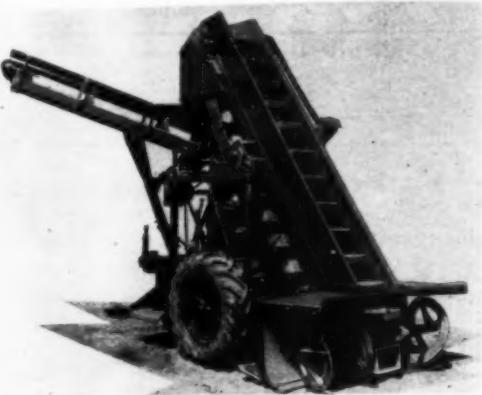


America's audience of contractors, public works officials, engineers applauds MICHIGAN'S performance records wherever this complete production unit is on location. MICHIGAN'S stamina and dependability — quick changeability to Crane, Clam, Dragline, Trench Hoe — time saving truck mobility and economy plus 28 m. p. h. road speed are high lights of the MICHIGAN picture. Available in 3 1/8 yd. and 1 1/2 yd. capacities — Single Axle, Dual Tandem and Four-Wheel Drives.

See the MICHIGAN at the Road Show — Space F-2. Write today for WORK BOOK CM-10.

MICHIGAN POWER SHOVEL CO. Benton Harbor, MICHIGAN, U. S. A.

PNEUMATIC-TIRED BUCKET LOADER, built for fast highway towing is available in two models: Standard machine with high bucket loader boom and swivel spout and low clearance model with short boom and swivel conveyor. High boom loader may be used for handling sand, gravel and crushed



stone from stock piles to trucks; in material yards for loading cinders, coke and coal; by maintenance departments which stockpile chips on shoulders prior to seal coat resurfacing and patching operations; for handling surplus material deposited by bulldozers and blade graders in grading and leveling operations; and for loading trucks for sanding



icy pavements. Low clearance model, in addition to advantage of portability, has low clearance and swivel conveyor discharge. Trucks may back under or with conveyor swung to one side and continue out in same direction. Earth bladed from ditches on to road shoulder can be loaded into trucks which drive under and out, machine clearing branches of overhanging trees. Floating scraper gives satisfactory cleanup.—Barber-Greene Co., Aurora, Ill.

★ ★ ★

NEW 34E DUAL-DRUM PAVER, equipped with diesel engine and automatic hydraulic controls, is designed to minimum height to facilitate passage under overhead bridges when moving from job to job. Carry-



ing longer boom than older 27E dual-drum model new machine is provided with proved type of scientifically designed mixing blades and drums and with new form of two-piece discharge chute. Substantial fuel savings are claimed for diesel power unit. Hydraulic controls, with automatic features, operate water valves, transfer chute; discharge chute and boom swing — Ransome Concrete Machinery Co., Dunellen, N. J.

MORE POWER TO YOU

3 heavy-duty models for your dump trucks
100 hp., 150 hp., 200 hp.

Not merely enough power to do the job . . . and get by . . . not the kind of power that needs a soft spot or ideal working conditions but power whose adequate performance invites you to tax it to the limit . . . "give it the works."

Your toughest jobs . . . the ones that call for long hours . . . continuous operation . . . full loads . . . jobs, perhaps, too expensive to operate . . . too costly to service . . . you can't pick a job too tough for a Cummins Diesel because right now the Cummins Diesel is doing a similar job for some contractor. Why not find out the facts for yourself? Ask any Cummins dealer or write direct to Cummins Engine Company, 1616 Wilson Street, Columbus, Indiana.

Euclid's new tractor scraper powered with 150 hp. Cummins Dependable Diesel. This fast-moving earth mover extends the practical hauling distance for scraper work. Capacity, 12 cu. yds. Travel speed, selection of eight speeds ranging upwards to 2½ mph.



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DIESELS

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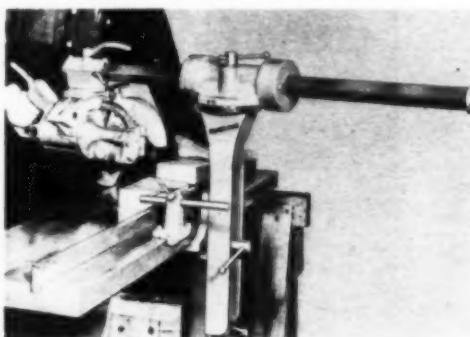
PORTABLE TEST DRILLING RIG for operating improved type of soil sampler, and rotary boring, makes it possible to obtain undisturbed cores for determination of moisture content, density, compressibility and sheer strength. It is claimed that borings may be made to depths ranging between 60 and 300 ft. at average cost of \$1.00 per foot, including operating expenses. Part of low cost results because casing is not required for borings up to 100 ft. in depth unless free flowing sand and gravel layers are encountered. Rig is mounted on



FWD four-wheel drive truck, but by disconnecting six U-bolts, it may be detached and moved on to barge for drilling over water or skidded to difficult boring locations on steep hillsides. May also be rigged for driving light piles into marsh lands or river beds whenever temporary trestle or working platform is needed in inaccessible locations. Gasoline power unit, independent of truck has five-speed truck transmission mounted in industrial conversion unit, providing ample power and flexibility with gear ratios to meet all operating requirements. Churn drill with spudding beam actuates 500-lb. hammer to drive sampler outfit. With proper bits, it is claimed that holes 8 to 12 in. can be opened through rock to depth of 400 ft. Thirty-inch rotary table is mounted on back of drill frame for driving 24-in. auger bucket. Double-drum type, 7-ton hoisting unit with three-speed transmission, each drum supplied with $\frac{3}{4}$ -in. steel cables for sampling and drilling lines. Derrick constructed of heavy steel ship channels is 32 ft. high when erected and 11 ft. 6 in. high when folded and ready for road.—Four Wheel Drive Auto Co., Clintonville, Wis.

★ ★ ★

RADIAL SAW ARM, for use with any Power King electric saw, is supported rigidly by heavy, rib-braced column and bracket and rides on eight lubricated ball bearings mounted on swivel head. Work capacities: 28-in. arm travel permits maximum cross-



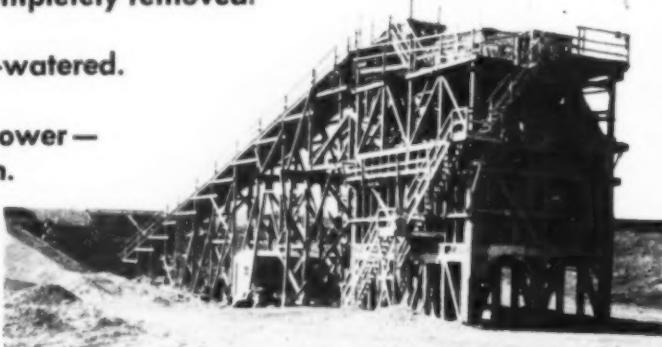
cut in 1-in. material of 25 in. with 8-in. saw, $2\frac{1}{2}$ in. with 9-in. saw, $2\frac{3}{4}$ in. with 10-in. saw, $2\frac{1}{2}$ in. with 11-in. saw. Trunnion bracket graduated 0 to 45 deg. for bevel cuts—may be swiveled and locked for ripping. Swivel head is graduated 0 to 60 deg. both ways for mitre cuts. Screw with ball handle control adjusts arm height between 0 and 9 in. All adjustments made with quick-acting clamps and locks. Easy-to-read index plates. Said to be quickly and easily set up for rip, cross-cut, and mitre, either straight or bevel, and to be ideal for accurate scoring of brick, stone and tile.—Power King Tool Corp., Warsaw, Ind.

RELIANCE PRODUCTS

Reliance offers a complete line of Rock Crushers; Bucket Elevators; Revolving Screens; Storage Bins; Pulverizers; Chip Spreaders; Heating Kettles; Bin Gates; Feeders; Belt Conveyors; Grizzlies; Air Separators; Sand and Gravel Spreaders; Wash Boxes.

1 Foreign substances completely removed.
2 Sand thoroughly de-watered.
3 Saves head room, power—simplifies distribution.

The best results in cleaning sand and gravel are obtained through the use of Reliance System Revolving Screens and Paddle Type Boxes. Clay, loam and other foreign matter is completely removed and floated away. The sand is de-watered while being carried to the storage bin. The single sizing screen saves head room and power and simplifies distribution to storage. Send for Catalog No. 11.



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While nations at war are claiming bloody victories, we point with pride to an engineering accomplishment in CONSTRUCTIVE SUBMARINE ACTIVITY on the WORLD'S MOST DIFFICULT caisson job, The Narrows Bridge at Tacoma, Washington



This problematical excavating task was accomplished at a depth of 120 feet with a 9 miles per hour rip tide and a tremendous water pressure to hamper bucket placement and operation.

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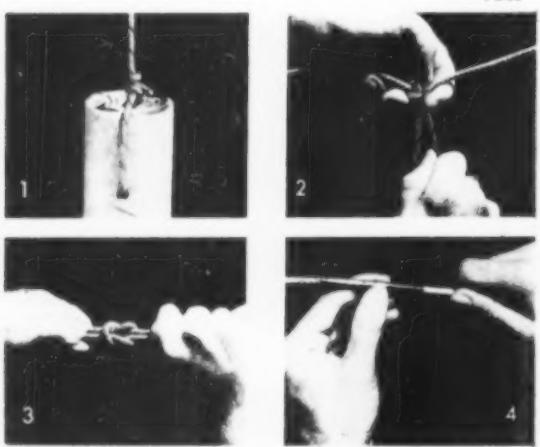
At the
ROAD SHOW
BOOTH G-13



With the entire load in direct contact with the powerful Primacord-Bickford Detonating Fuse, every cartridge in the hole "goes" with the full force of a primer cartridge. And while the explosive wave of Primacord is practically instantaneous—over three miles a second—the fraction of time delay between holes and between rows of holes allows proper relief of burden. Better results are afforded with a minimum quantity of explosives, and savings are effected in loading, connecting holes, and removing the well-broken-up material.

THE ENSIGN-BICKFORD CO., Simsbury, Conn.
Makers of Cordeau-Bickford Detonating Fuse
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PRIMACORD-BICKFORD Detonating FUSE



1. Tie through cartridge.
2. Half hitch branch to main line.
3. Connect main line lengths with square knot.
4. Fuse and cap on end of main line.

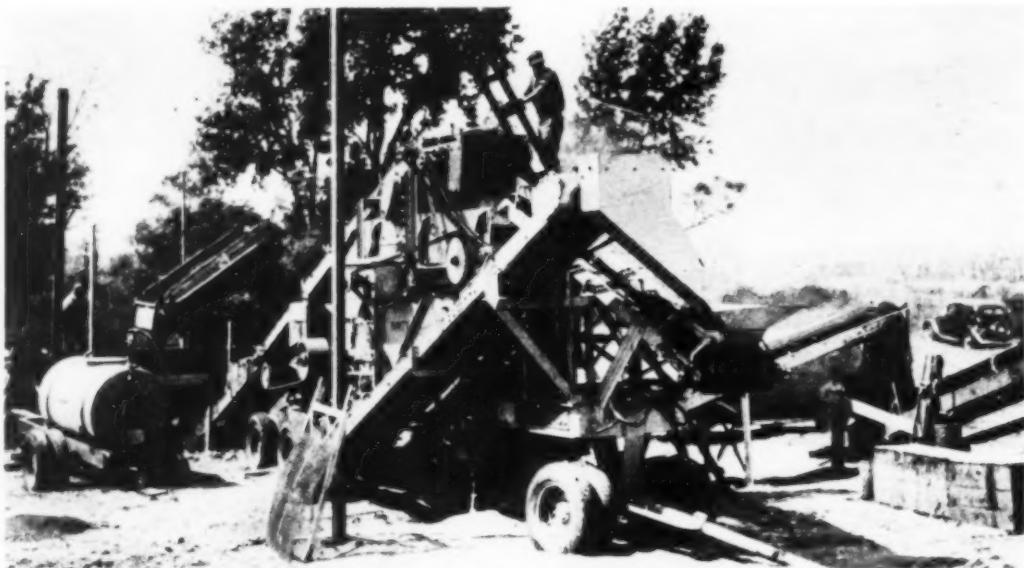
30 Miles in 60 Days IOWA PLANT-MIX STABILIZED BASE

(Continued from page 71)

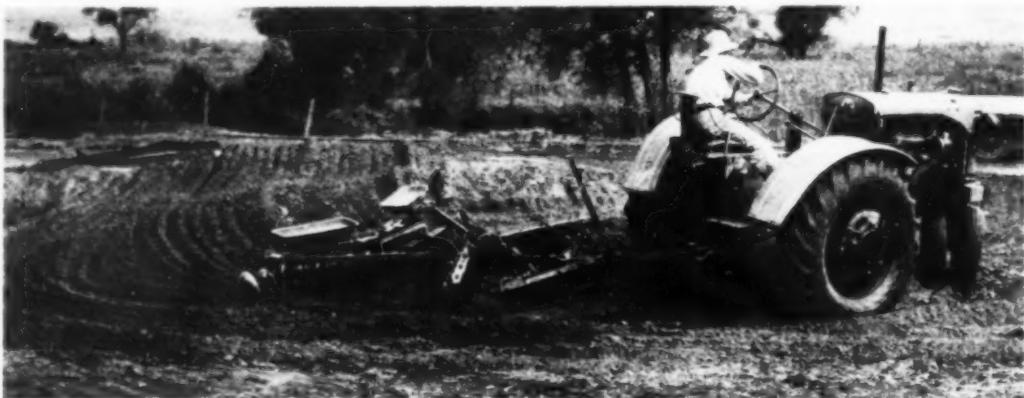
120 per cent of optimum. To facilitate proper mixing and discharge, the contractor added water at the mixer raising the moisture content above optimum, within the specified limit.

Five 1,000-gal. tank trucks belonging to the Concrete Materials & Construction Co. wetted subgrade before stabilized material was dumped and moistened base mixture during compaction whenever dry.

(Continued on page 98)



PIT-RUN SAND AND GRAVEL drop from dump trucks into feeder conveyor of screening and crushing plant which pulverizes oversize pebbles before passing entire output to inclined conveyor at right.



TWO-WAY DISK HARROW pulled by farm tractor pulverizes clay in stockpile at mixing plant.



FRESNO SCRAPER moves pulverized clay from stockpile and dumps it through grillage over boot of conveyor carrying material to overhead bin.

**MATERIALS
METHODS
FACILITIES
EXPERIENCE
ORGANIZATION**



Five Vital Points - **THAT BRING LONG LIFE TO** **"HERCULES" (RED-STRAND) WIRE ROPE**

Consistent top-flight performance is never a matter of chance, and the year by year record of dependable field service that "HERCULES" (Red-Strand) Wire Rope has established, is due to our strict adherence to *all* details of manufacture. These details start with the selection of proper materials, and they follow through until the last test and inspection has been made and approved by experienced workmen.

Because nothing is left to chance in the manufacture of "HERCULES" (Red-Strand) Wire Rope, you can depend on it for longer life . . . lower operating costs . . . more satisfaction. Why not give it a trial?

Available in both Round Strand and Flattened Strand constructions—in either Standard or Preformed types

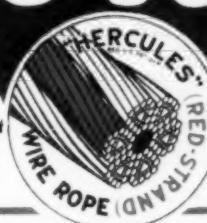
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STRENGTH

Just as nature endowed the elephant with amazing strength, so have designing and scientific methods embodied unusual strength in the ABW Solid Shank Shovel.

To say this famous shovel is the strongest shovel made, is no idle claim, for tests have proven its superiority and widespread consumer satisfaction substantiates this claim in performance. Two features are mainly responsible for this unusual strength.

- 1—The Patented ABW Shock Band, which adds substantially to the handle strength.
- 2—The blade and socket made from one solid piece of steel.

Add to these features the quality of the steel, the heat treating process, and the Second Growth Northern Ash Handle and it is easily understood why the ABW Solid Shank Shovel is the strongest shovel made. The D Handle Shovel is equipped with the famous ABW Armor-D Handle—the most perfect handle made.

Ask your Jobber



ABW PRODUCTS

Shovels	Rakes
Spades	Post Hole
Scoops	Diggers
Forks	Agricultural
Hoes	Handles

AMES BALDWIN WYOMING CO.
PARKERSBURG, W. VA. • NORTH EASTON, MASS.

(Continued from page 96)

windy weather made this procedure necessary.

Motor Graders—Four Caterpillar diesel motor graders, three 55-hp. and one 65-hp., all equipped with 12-ft. blades, and one Wehr 35-hp. gasoline motor grader with 10-ft. blade performed a number of services, starting with scarifying and shaping of subgrade and going on to spreading of stabilized mixture and shaping of base. One diesel motor grader took care of spreading dumped material for the base ahead of the compacting equipment.

Farm Tractors—Seven Allis-Chalmers 35-hp. gasoline row-crop tractors, capable of turning on short radius, pulled sheepfoot rollers, steel trailer rollers and pneumatic-tired rollers. At the mixing plant, one of these tractors operated the pulverizing harrow and fresno scraper handling clay.

Compacting Equipment

For specified subgrade compaction of 95 per cent, the contractor relied on sheepfoot rollers, and this equipment gave 97 to 98 per cent compaction on all four jobs. The fourth job, more than 8 mi. long, had its subgrade scarified and compacted in 5 days. Three Bros dual sheepfoot rollers worked on subgrade and on base compaction, alternating between the two stages of construction as conditions warranted.

On base construction, the sheepfoot rollers were followed by plain steel and pneumatic-tired rollers. Two steel tandem rollers, a 17-ton and an 8½-ton, were old steam machines converted in the contractor's shop to McCormick-Deering and Ford V-8 gasoline power. The larger unit exerted a roller pressure of 350 to 400 lb. per inch, and the smaller, of 250 lb. per inch. Two Bros pull-type rollers, filled with water, weighed about 200 lb. per inch.

On the fourth project, which may be taken as representative, the base required 57 dual-sheepfoot-roller hours per mile. The 17-ton roller went over the surface twice.

Following the steel rollers, three Bros pneumatic-tired rollers loaded to 11 tons with tires inflated to 35-lb. pressure worked continuously, 24 hr. a day, to remove any rough spots by their kneading and smoothing action.

Results

When the fourth job was visited, on the sixth day of base construction, the clay-gravel base put in during the first 3½ days showed densities of 98 to 107 per cent by Proctor tests. The section of 107 per cent density had a moisture content of 3½ per cent, the result of two dry, windy days, and the density of the 98 per cent section was expected to improve under continued compaction by rubber-tired rollers as its moisture content of 7 per cent, exceeding the optimum, was reduced by favorable weather conditions.

Progress—Contract starting date for all four projects was July 10, with a time limit of 60 working days. The contractor

(Continued on page 100)

DRAGLINE OR SHOVEL AS

the

54-B



Carries 2½ yard dipper
for standard operation

will give you
a NEW
IDEA of
profitable
**DIRT
MOVING**

FIND OUT ABOUT IT NOW!

Booms from 50 to 100 feet
Buckets from 3 to 1½ yards

See The 54-B at the Road Show in Chicago — January 29 to February 2

BUCYRUS-ERIE COMPANY
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MOVED
MORE
rock



• The Model 450 AMERICAN GOPHER owned by Booth & Flinn and used in extremely heavy rock cuts on Pittsburgh's Bigelow Drive has, according to those around it, "Moved more rock and dirt than any other machine on the job." In fact they admit that the AMERICAN GOPHER "Has taken care of practically all the rock work on this job."

Seven Models: $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$ and 2 yards.

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SOUTH KEARNY, N. J.



DEALERS WITH STOCK IN ALL PRINCIPAL CITIES
the Genuine CROSBY wire rope CLIP

PERFECT GRIP - DROP FORGED
STEEL - HOT GALVANIZED



(Continued from page 98)

set up the mixing plant and turned out the first batch for job No. 1 on July 11. Base construction on the fourth and final project was completed Sept. 13, and the wearing mat was finished about a week later.

Wearing Mat—Included in the contracts for the four jobs were a prime coat of 0.4 gal. per square yard of tar and liquid asphalt MC-1A and a surface treatment of the inverted penetration type consisting of 0.6 gal. of asphaltic oil and 60 lb. of aggregate laid in two applications.



BECAUSE CLAY used in mixture at this plant set up has too high plasticity index, workmen dump bucketsful of sand into each batch to reduce plasticity index to specified range.

Cost—Average cost of 24-ft. completed roadway on the four contracts, totaling 29 $\frac{1}{2}$ mi., based on bid prices of the Concrete Materials & Construction Co., was \$8,000 per mile.

Administration—For the Iowa Highway Commission, Fred R. White is chief engineer and Frank H. Mann is assistant chief engineer, in charge of construction.

Under S. P. (Sid) Moore, general manager, Concrete Materials & Construction Co., contractor, Cedar Rapids, Iowa, Faye C. Moubry, superintendent, and Fred Fiala, plant superintendent, directed construction and plant operation on the four contracts.

Belt Parkway

(Continued from page 63)

Concreting of the 8-in. thick slabs is done by standard methods and equipment. The proportions of the mix are 1:1 $\frac{3}{4}$:3 $\frac{1}{2}$. Internal vibration of the poured concrete is required. Pouring requires two stages: First, a depth of 6 in., with surface rough-

(Continued on page 102)

Modern Aggregate Plants . . . by

TELSMITH

Like hundreds of Telsmith plants all over the world, these new rock crushing and gravel washing plants have operated smoothly, efficiently and profitably right from the start. A Telsmith plant means the latest in equipment—crushers to bin gates—Telsmith-designed-and-built for extra staying power, greater flexibility and capacity, lower operating and upkeep costs. And Telsmith *Balanced* Engineering Service and centralized responsibility fits that plant to your own particular needs.

Write for Bulletin EP-10.

Arundel Corporation, Woodberry Quarry, Baltimore, Md.

Crystal Concrete Products Co.
Braintree, Mass.

Arlington Stone
Company
Leesburg, Va.

Richmond Sand
& Gravel Co.
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Brooks M. & S. Co.

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Roanoke Trce. & Eng. Co.

Canadian Vicker, Limited

Gordon Russell, Ltd.

(Continued from page 100)

ly screeded off to receive built-up welded steel reinforcing mats; second, a 2-in. depth of concrete, forming the roadway surface, which is darkened by the addition of emulsified carbon black in amount equal to 3 per cent of the weight of portland cement in the mix. After machine-finishing and cross-brooming, the slabs are cured by the application of a bituminous spray to the surface. The concrete produced has exceeded by at least 1,000 lb. per square inch the specified minimum crushing strength of 2,500 lb. per square inch after 28 days.

The concrete service roads paralleling the main six-lane parkway are from 30 to 40 ft. wide, 9 in. thick and have white cement curbs 6 in. high.

White Cement Curbs

Along the outside traffic lanes on each side of the central dividing strip are constructed low concrete curbs extending 3 in. above roadway level. They are keyed to the roadway slab and their tops are cast with white cement to outline the edge of the pavement for safe night driving. Similar curbs of white cement will flank the dividing strip after the two inner traffic lanes are installed on either side of it. Along the pavement edges in some places where white cement curbs are omitted, traffic guide lines of white cement are cast as ribbons 6 in. wide and 2½ in. deep integral with the roadway surface.

Bridges

A major feature of the Belt Parkway project is the impressive total of 70 bridges constructed to eliminate any grade crossings and to create a truly non-stop, express route. While many of these structures are of the rigid-frame type, with stone masonry facing, their design is in no sense standardized and they offer a pleasing variety of appearance. Bridge types include rigid frames of concrete and steel, steel girders, and concrete arches of both circular and elliptical shapes. In addition there are pedestrian underpasses at certain points where existing streets have been dead-ended at the Belt Parkway line.

* * *

Brick Paving Job ON LONG VIADUCT

(Continued from page 89)

to be done by one truck and driver. Brick in the proper quantities were stockpiled in rows on the sidewalks, from which they were delivered to the brick droppers by a roller conveyor.

Mastic Cushion — Concrete sub-base of the approaches and 35 concrete T-beam deck spans was first given a prime coat of cut-back asphalt, on which was spread a ½-in. asphaltic sand mastic bed. To strike off the bedding course, the paving crew used a 20-ft. crowned templet supported

(Continued on page 104)

Mall

GASOLINE POWERED VIBRATORS PAY BIG DIVIDENDS



MALL 7000 r.p.m. gasoline powered vibrator on pneumatic mounting. Can also be used for CONCRETE SURFACING, PUMPING, SAWING, DRILLING, SANDING and GRINDING.

MALL vibrators will quickly pay for themselves and pay you in savings on time, labor, cement and power. In addition, you get better bond with reinforcement—stronger, denser and more durable concrete free from aggregate pockets and honeycombs, thus eliminating hand patching.

Let us tell you more about our line of gasoline powered and electric vibrators for every type of concrete construction.

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**POWER SHOVELS
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CRANES
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½ to 2 Cu. Yds.

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GIVES YOU
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- MORE FEATURES
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- New Mixers — that boost output — with drums that can last a lifetime.
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- 100% New "Kost Kutter" Power Saw Rigs in Jr. and Sr. Models.
- An Augmented Standout Line of Plaster, Mortar, and Bituminous Mixers.

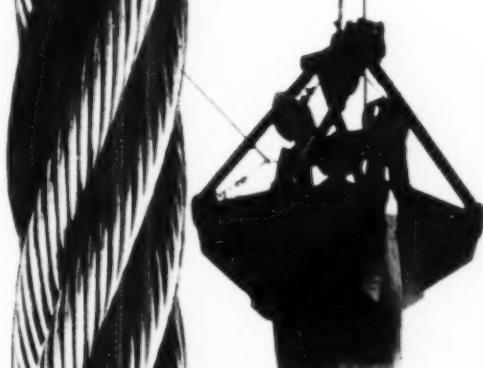
Yes, you will see all this new equipment in the C.M.C. Exhibit at the Road Show. If you can't be there — write today and get your reservation in for the new C.M.C. Catalog — the finest book on equipment ever issued. It will be available in January.

CONSTRUCTION MACHINERY COMPANY
WATERLOO, IOWA

HAZARD LAY-SET

Preformed

Pre-broken-in



● When you put Hazard LAY-SET Preformed on the job there is no need to "baby" it until it is "broken-in." Hazard LAY-SET Preformed is preformed at the mill—pre-trained to the job.

Take this single example for instance. Closing lines on some clamshell buckets must take terrific beatings because of small sheaves and reverse bending. It is in such places that LAY-SET Preformed proves its merit right from the start.

LAY-SET has the stamina to endure the punishment *much* longer than ordinary wire rope. That means fewer shutdowns, fewer rope replacements, steadier production, greater profits.

Write today to the Hazard district office nearest you and ask for the name of your nearby Hazard distributor. He will show you how to effect real economies in your machinery operation. All Hazard ropes made of Improved Plow Steel are identified by the Green Strand—and Green Signifies Safety.

HAZARD WIRE ROPE DIVISION

Established 1846

AMERICAN CHAIN & CABLE COMPANY, INC.

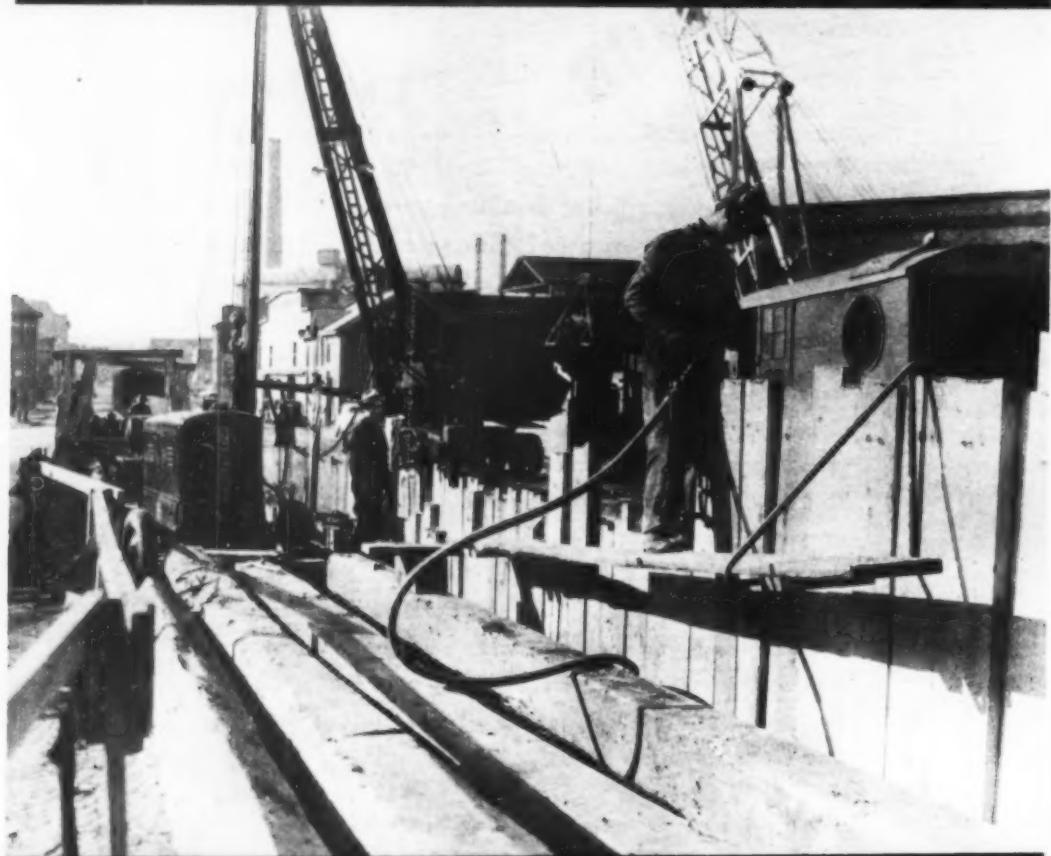
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And see why Schramm Compressors are now the choice of Contractors.



SCHRAMM, inc.

900 E. VIRGINIA AVE.
WEST CHESTER, PA.

(Continued from page 102)

at each end on compensating longitudinal beams equipped with two end rollers operating on box side rails of 1x5-in. cypress with lapped joints, the rails resting directly on the concrete sub-base. This method of templet suspension reduced the effect on the bed of unevenness in side rails by about three quarters. After the templet had passed over the bed, the box rails were removed, and bed material was luted into the rail areas. The bed was finally struck off, lightly, with a 10-ft. aluminum straight-edge operated parallel to road center line.

Rolling with an 8-ton Buffalo-Springfield tandem roller was carried out on 1x10-in. yellow pine boards. Rolling on boards entailed little additional expense and resulted in a smooth job with more uniform bearing throughout the bottom surface of each brick. Careful culling, straight-edging, correction of high and low spots, and straightening of courses and of cream-colored center-line marker brick preceded and followed the rolling.

Asphalt Filler — After the proper surface and alignment of courses had been obtained, the top surfaces of the brick were coated with a water solution of 35 per cent calcium chloride and 1 per cent starch by means of a small power-driven compressor and tank feeding a twin-nozzle spray head through 80 ft. of $\frac{3}{8}$ -in. hose. This coating permitted easy and clean removal of excess asphaltic joint filler, poured on the pavement immediately following the spraying of the separating agent.

Filler was heated to 425 deg. F. in four oil-burning kettles equipped with discharge valve extensions for safety in operation. After the poured filler had cooled sufficiently, excess asphalt was easily removed with heavy scrapers made by welding 8x6x3/16-in. steel plates to $\frac{3}{4}$ -in. pipe handles.

Recovered asphalt was accumulated on sheet metal mats and returned to the kettles for reheating. Use of sheet metal mats eliminated the possibility of withdrawing any of the filler from the finished paving when picking up the reclaimed asphalt. The whole pavement was finally inspected for filler subsidence, and joints were repoured where necessary.

Traffic Markers

Throughout the length of the job, a center-line marker composed of two longitudinal courses of cream colored brick was used. These marker brick were laid several feet in advance of the placing of the regular transverse courses. At the center line of the roadway, a chalk line was snapped on the finished mastic bed to guide the placing of the center-line marker brick in perfect alignment. Regular transverse brick courses were started at the center-line markers and laid toward the curb, assuring uniform batting in the central portion of the roadway and confining the non-uniform batting to the little traveled area adjacent to the curbs.

For 25 per cent of its length on the structure the 40-ft. roadway is on a 5,000-

(Continued on page 106)



BULLDOZERS • GRADEBUILDERS

ABOVE—A Baker Bulldozer on the Pennsylvania Turnpike crashing through rocky material near Somerset, Pa. Connell & Laub, contractors, Dayton, Ohio.

BULLDOZERS GRADEBUILDERS

Where the job demands precision of performance and ruggedness for the tougher tasks, Baker Hydraulic Bulldozers and Gradebuilders are always in evidence. They represent the backbone of many important construction projects.

New and improved models widen their range of work. Interchangeable moldboards permit adaptation to changing conditions. Then, too, you have that easy control found only on Bakers which makes them the favorites of tractor operators everywhere.

Down pressure—twin cylinder operation—high blade lift—these are just a few of the distinctive features you will find on every model.

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AT THE
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CHICAGO
SPACE FIRST
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The performance of Baker Hydraulic Scrapers in all kinds of soil, from tough clay to sand, demonstrates the value of the flat digging angle—a feature of every model. It makes loading easier. Less power is required to load a Baker to capacity than other scrapers of similar size.

Earth movers appreciate the smooth, even grades made by Baker Scrapers—no gouging or wavy surfaces. The digging angle is practically constant, regardless of depth of cut. Dumping is clean and the load is spread evenly.

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Better, Safer Construction Jacks Since 1899

SIMPLEX
GOLD MEDAL AWARD SAFETY JACKS



Continued from page 104)

ft. radius curve. In this area, transverse radial chalk lines were snapped in the finished bed at about 5-ft. intervals. This marking permitted the brick droppers to keep a frequent check on the alignment of their courses and assured a uniform width of joints.

Stop lines comprising two transverse courses of cream brick were placed against traffic from all intersecting side streets. These stop markers occupied only that half of the street used by oncoming traffic.

At the west end of the job about half of the traffic makes a right turn into another street. After the brick had been laid and rolled at this intersection, an arc was marked in chalk on the center line of the right turn. Sufficient brick were removed at 18-in. intervals to permit the insertion of a cream half brick as a marker and the relaying of adjacent courses in such a manner that no bats less than half brick were necessary. This use of half brick spaced at intervals rather than full brick for the marker resulted in a smooth curve which otherwise would not have been possible without extremely poor batting of adjacent brick and irregular alignment.

Drainage Provisions — It is essential on a concrete bridge structure that proper drainage be provided at the gutter to avoid accumulation of water under the brick with consequent eventual damage to the concrete of the bridge. For this purpose, instead of the usual mastic bed adjacent to the curb, a 6-in. strip at that location was bedded with a mixture composed of 3 per cent cut-back asphalt, 8 per cent limestone dust, and 89 per cent buckshot gravel. This seepage bed is drained at 5-ft. intervals by vertical 1-in. copper pipe drains extending through the bridge deck.

Expansion Joints

In the long concrete viaduct, 2 in. for expansion is provided at the end of every third span. A block of concrete 10 in. wide, resting in notches in the concrete floor of the adjacent bridge decks, covers this opening. On each side of this block, 1 in. of premolded elastic material carries the expansion provision to the top of the brick pavement, the concrete block being of such thickness as to come flush with the top of pavement. To avoid laying the adjacent brick against these two strips of elastic material, thereby inviting raveling or tipping of the brick, a concrete header 6 in. wide, of the thickness of the brick and mastic bed, was provided between the joints and the adjacent brick.

Concrete headers and blocks were built in advance and the brick paving laid to them. To avoid confusion with traffic markers the blocks and headers were colored with a mineral admixture carefully selected to match the brick.

To meet similar conditions at expansion joints in the concrete sub-base of the approach paving, where premolded elastic material again extended to the top of the brick pavement, adjacent headers were secured by laying three courses of brick on each side of the joint in cement grout bonded to the sub-base and by using mor-

Continued on page 108

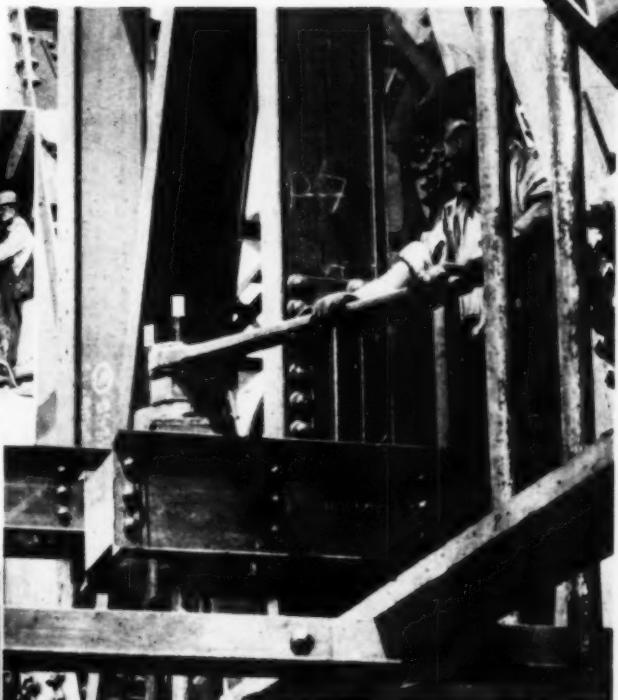
Speaking of "Small" Tools...

the BIG name is

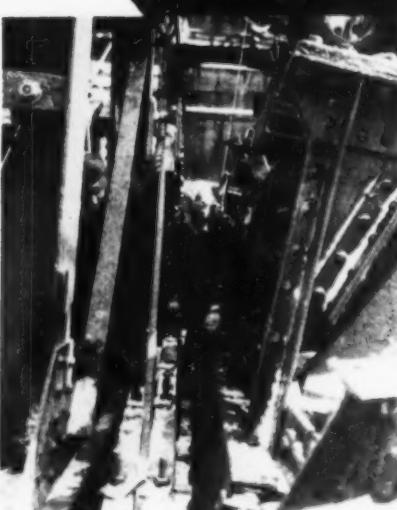
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● Around construction work we find the Lowell Steel Socket Bridge Wrenches classified as the dependable tool for the job.



● Put a Lowell Bridge Builders Wrench on the shank or shaft and it stays there until the work is completed. Time saved by not retightening.



● In the tunnels like under the Hudson River bolting heavy parts calls for husky dependable wrenches. That is why "LOWELLS" were chosen.

● Up in the air they must have dependable tools and that is why this man is using a "LOWELL"

● Where brute strength is needed and small space provided "LOWELLS" prove their worth



Briefly if you want the Reversible Ratchet Wrenches that can "take it"—and do the work they're made for—and protect the men who use them—the word is "LOWELL". There's a Lowell Wrench in every size from 6" to 6 feet. Send for descriptive Catalog R.

● Much time is saved by using Lowell Reversible Ratchet Wrenches where nuts are continually tightened and loosened like on come along clamps.

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can be made for the specific conditions a belt must work under on your job.

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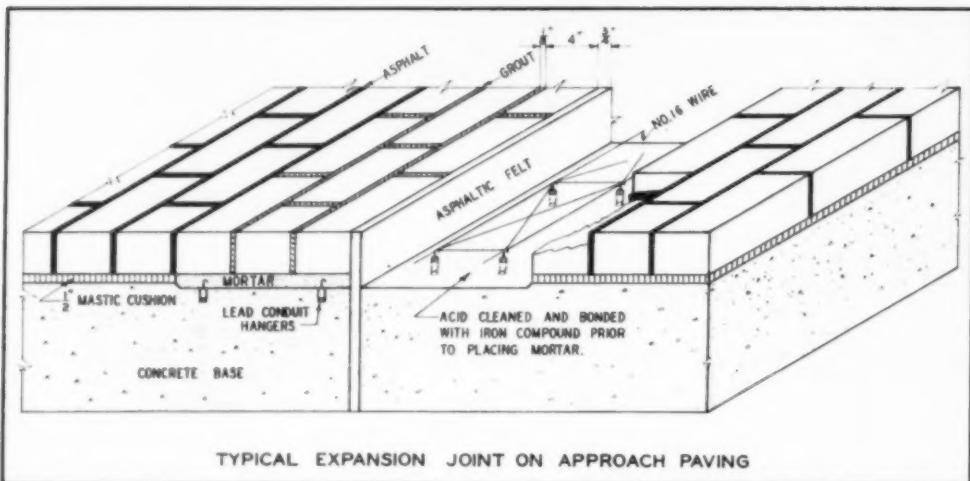
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The originators of the
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of contractors' rubber goods



(Continued from page 106)

tar-filled joints. The mortar was similarly colored by an admixture to preserve the general brick color and avoid any lighter colored joint which might be confused with traffic markers.

Administration—Leroy C. Smith, county

highway engineer, and H. A. Shuptrine, bridge engineer, designed and supervised construction of this project, the writer being in direct charge in the field. Max Barton, district engineer, and D. M. Hatch, director of operations, were in charge for the Works Progress Administration.

★ ★ ★

Pennsylvania Turnpike

(Continued from page 54)

essential to rapid progress on the job. Walker Bros. entered into a materials contract with the Shippensburg Stone Co., which erected two batching plants, No. 1 at the mid-point of the job and No. 2 about 2 mi. from the west end, to supply truck-hauled batches to the mixer skip. The two plants were similarly equipped with Blaw-Knox bins and batchers. When operating from Plant No. 1, photographs of which appear with these notes, the subcontractor used eight to sixteen two-batch trucks to haul to the mixer, at distances varying from 1 mi. to 6 mi.

Sand and bulk cement were shipped by rail to a siding at Newville, about 4½ mi. east of Plant No. 1. The daily standing order, necessary to meet the large paving requirements, amounted to fifteen cars of sand (1,000 tons) and eight cars of bulk cement (2,400 bbl.). Eight to twelve trucks

of 5-, 7-, and 8-ton capacity hauled sand from the siding to Plant No. 1. Five special trucks (four Internationals hauling 7 to 8 tons, and one Chevrolet hauling 3 to 4 tons) moved cement from the cars to the plant bin.

Coarse Aggregates—Crushed limestone in two sizes came from three local quarries in the vicinity of Newville, an average distance of 9 mi. from Plant No. 1. Twenty to 25 trucks of 5-ton average capacity, with some units carrying 6 and 7 tons, hauled coarse aggregates from the quarries to the plant.

Batch Weights—Each batch contained 809 lb. of cement, 1,592 lb. (dry weight) of sand and 2,952 lb. (dry weight) of coarse aggregates. Separated sizes of coarse aggregate were graded from ¼ in. to 1 in. and from 1 in. to 2½ in. A proposed max-

(Continued on page 110)



WHERE SEEPAGE MAY OCCUR, engineers call for installation of under-drains crossing subgrade diagonally. This trench contains 6-in. perforated subdrain tile backfilled with crushed rock. Some subgrade drains contain crushed rock only. Mechanical form tamper packs backfill under steel form at right.



*'Open your job to traffic
-not criticism'*

Only three days between these "before and after" pictures of Third Street, Harrisburg, Pa.

**No over-long
Traffic Interference
in Harrisburg, Pa.**

City Engineer, E. Clark Cowden
Ready-Mix Concrete furnished by Pennsylvania Supply Co.

Lehigh Early Strength Cement was used for repaving on about three miles of city streets. The pictures show typical examples.



Market Square, Harrisburg.
Concrete in use within 24 hours
after pouring

HIghway builders are on a spot. The public demands good roads and streets, but is critical when construction barriers hinder convenience and business for long. That's why contractors and public officials use Lehigh Early Strength Cement. It makes better, denser concrete that often can be opened to traffic in 24 to 48 hours. Inconvenience to citizens is trifling and other big advantages result.

For the road builder, quick use of concrete increases operating efficiency and usually reduces costs, including overhead. For bridges, culverts, tunnels and grade crossing elimination, the faster curing saves on form costs, drastically cuts job duration. In cold weather the freezing hazard is less; heat protection costs are minimum.

Use Lehigh Early Strength Cement when time saving is of public advantage, or where it will reduce costs. The Lehigh Service Department will gladly answer any questions.

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EARLY STRENGTH
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You'll soon discover why "BOSS"
Couplings lead all others in sales
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"BOSS" Hose Couplings have a long record for safe, economical service on air, steam, and liquid lines, either high or low pressure. There are two important reasons for their unquestioned leadership — first, the positive insurance they provide against leaks, pressure losses and shut-downs; second, the protection and longer life they give the hose by guarding it against failure at its most vulnerable points — the ends.

All parts steel or malleable iron, cadmium plated to prevent rust. Made in sizes $\frac{1}{4}$ " to 4", inclusive, with efficient four-bolt "BOSS" Offset Clamp on sizes 1" and larger. Two-bolt clamp on $\frac{1}{4}$ " and smaller.



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"GJ-BOSS" GROUND JOINT HOSE COUPLINGS

The dependable, trouble-free service these couplings provide has established new standards of efficiency, safety and economy. No time out for replacing worn or lost washers. A copper insert in the spud fits the accurately machined rounded head of the stem, forming a soft-to-hard metal seal that remains leak-proof regardless of wear.

All parts, except copper insert, are steel or malleable iron, cadmium plated. Made in sizes $\frac{1}{2}$ " to 4" inclusive, with sturdy four-bolt "BOSS" Offset Clamp on sizes 1" and larger. Two-bolt clamp on $\frac{1}{4}$ " and smaller.

NOTE: For companion male coupling for both "BOSS" and "G J-BOSS", described above, specify "BOSS" Male Coupling, Style MX-16.

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DIXON

VALVE & COUPLING CO.

MAIN OFFICE AND FACTORY: PHILADELPHIA

CHICAGO • BIRMINGHAM • LOS ANGELES • HOUSTON

(Continued from page 108)

imum water content of $5\frac{1}{2}$ gal. per sack was adjusted to give a workable mix in a slump range from $\frac{1}{2}$ in. to $1\frac{1}{2}$ in.

Beam Tests — Concrete was cured 72 hr. under wet burlap. Beam breaks of 800 to 1,000 lb. per square inch in 7 days gave ample evidence that trucking could safely be permitted on the slab at an age of 10 days.

Pavement Joints — Special Bethlehem steel-doweled expansion joints, with pressed asphalt-saturated fiber filler, were spaced 76 ft. c. to c. The pavement contains no contraction or construction joints. A shallow V-shaped key was formed with removable steel plates in the inner edge of the first lane for each roadway, and dowel bars were cast in the concrete to tie the two lanes together across the longitudinal joint.

94-Man Shift — Walker Bros. ordinarily worked two 8-hr. shifts, with a working force of 94 men on each shift. The men were distributed: 49 on forms, eleven on fine grade, seven on removable plates and dowel bars, thirteen placing concrete, eight finishing slab, and six on burlap. This enumeration does not include truck drivers.

Under the general supervision of Samuel W. Marshall, chief engineer, Harrisburg, and H. L. Lundy, construction engineer, Shippensburg, the paving work was executed for the Pennsylvania Turnpike Commission by J. A. Gaynor, resident engineer. For the paving contractors, Walker Bros., Chambersburg, Pa. C. O. Albright, superintendent, was in charge of the job. Paul Walker and Frank C. Walker are the members of the contracting firm.

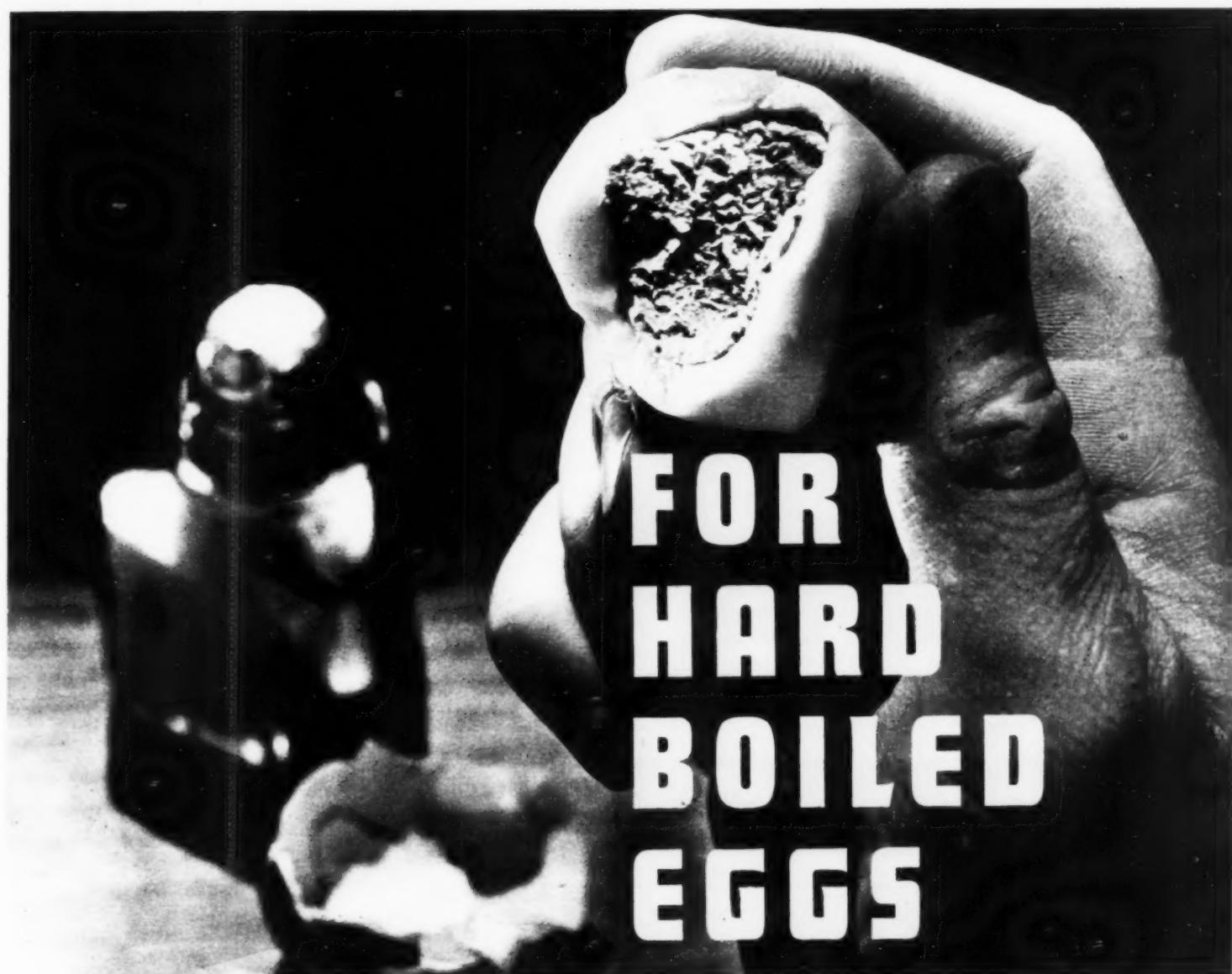
NEBRASKA TESTS Soil Processing

(Continued from page 82)

times before the gang plows joined in the operation. Gang plows started in at the center, casting the mixture toward the center line, and worked out to the edges, leaving outside furrows to mark the limits of the soil-cement treatment. Turning up the bottom of the mixture, the plows worked to the full depth of soil-cement treatment and established a uniform bottom cross-section.

Water Distributors — Several units were available for pressure distribution of water in the wet-mixing process. An old 800-gal. pressure distributor with a 24-ft. spray bar was used at times to put water on the full width of roadway. More often the contractor operated a trailer distributor equipped with a 12-ft. spray bar and a 2½-in. centrifugal pump to take water directly from 2,000-gal. tanks on truck trailers. One of the motor graders helped to pull the water trucks through the mixture, a tachometer device being attached to the blade with the speed dial in plain view.

(Continued on page 112)



FOR HARD BOILED EGGS

This is the rope for men who compare the service received from a rope against the initial cost of the rope plus cost of installation. They are the fellows who know real rope costs and buy intelligently. Wherever Wickwire Rope is used, past average rope costs are always equalled or lowered. These are strong statements, but they must be strong because they are addressed to men who buy on facts and figures . . . typical users of Wickwire Rope.

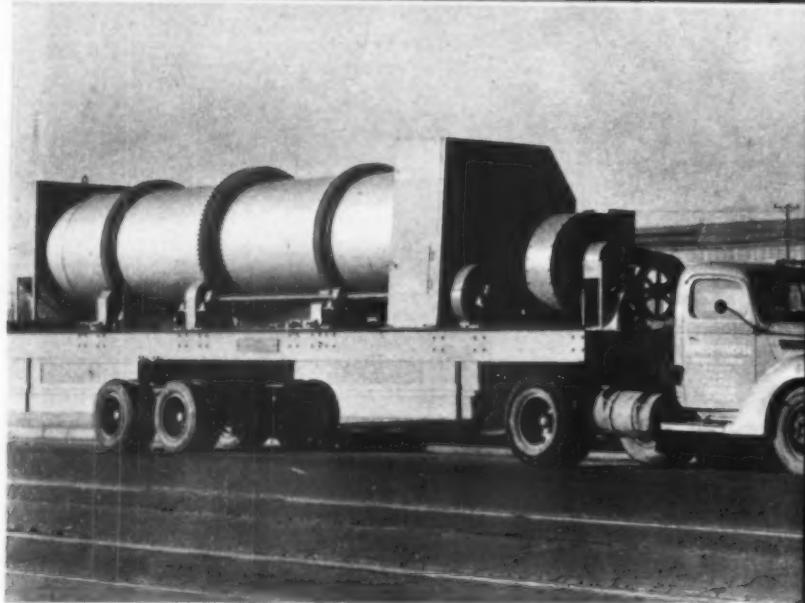
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Wickwire Spencer offers Wickwire Rope in both Regular Lay and Wisscolay Preformed in all sizes, grades and constructions. Have your next rope a Wickwire Rope and watch your rope costs go down.

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Among dragline users Page Automatic buckets have a reputation of increasing yardage 15% to 30% over that obtained with other type buckets of equal size and weight.

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BUILT
IN SIZES
3/4 TO 15
CUBIC YARDS

(Continued from page 110)
of the operator to assist in gaging water application to 0.7 gal. per square yard, a rate which permitted a 2,000-gal. tank to complete two 1,200-ft. passes 12-ft. wide with one tankful.

Optimum moisture content of the mixture was 17 per cent. In hot, dry, windy weather the engineers increased the moisture content to 20 per cent to allow for evaporation losses during mixing and compacting. To impart this moisture content required addition of about 25,000 gal. on a 1,200-ft. section. Sprinkling took about 4 hr., during which wet mixing was carried well toward completion.

Wet Mixing—Following closely behind the water distributors, the rotary tiller and gang plows, supplemented by a spring-tooth harrow, continued the mixing operation as previously described for the dry mix. The equipment worked an average period of about 5 hr. to complete a 1,200-ft. section.

Compaction

As soon as wet mixing had produced uniform moistening of the mixture, a pair of Bros dual sheepsfoot rollers drawn by Allis-Chalmers 40-hp. gasoline tractors began packing the material. The rollers were loaded to a pressure of about 200 lb. per square inch of foot area.

After the roller feet had walked out of the lower half of the 5-in. compacted base, blade patrols shaped the material to rough cross-section while the rollers continued packing to within 1 or 1½ in. of finished grade. A garden cultivator then worked up the surface mulch for final shaping with the blades, followed by a float drag with a square frame of 2x4-in. timbers.

A pneumatic-tire roller with tires inflated to 45-lb. pressure completed surface compaction, the top being given a light shot of water followed by blading to take out irregularities during the process. The rubber-tire rollers continued packing until the soil-cement mixture was well compacted on the surface. About 4 hr. ordinarily proved sufficient to complete all compacting operations.

Bituminous Processed Soil

Sand from a waste pile was added to natural silty clay soil procurable alongside the project on the bituminous sections to produce a soil mixture containing 30 per cent fines passing the 200 mesh sieve. This soil was mixed with asphalt emulsion and with tar by a Barber-Greene traveling mixing plant equipped to add automatically metered quantities of bituminous materials and water to the soil picked up by bucket loader from a windrow. In the traveling plant, the soil-sand mixture was measured out from a hopper on to a traveling apron feeder and was sprayed with metered bitumen and water before passing into a twin pugmill mixer. The mixer discharged the mixed material in an unbroken windrow on the road at the rear of the machine.

With this plant, Lee & Johnson, Inc.,

(Continued on page 114)

CONTRACTOR'S FLEET PICKS UP 18% IN EFFICIENCY

• OVERALL efficiency and good performance are the first concern of a Standard Automotive Engineer when he goes to work on your fleet. When engines are operating efficiently, gasoline consumption is bound to drop. And that isn't all; maintenance costs drop, too. But there is no sacrifice in engine power to get these economies when this Engineer is on the job.

This service recently made an average increase of 18% in combustion efficiency in a Wisconsin road contractor's fleet. That meant not only a substantial reduction in gasoline consumption, but more power in each tractor, truck, and shovel in the fleet, and fewer delays for repairs on the job.

Find out how Standard's Automotive Engineering Service differs from any fleet checking service you have tried. One of these Engineers will be glad to tell you just what he does. You can reach him through your local Standard Oil (Ind.) office, or by writing 910 South Michigan Avenue, Chicago, Illinois.

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(Continued from page 112)

built 4½ mi. of emulsified asphalt construction (2½ mi. of 5-in. thickness and 2 mi. of 4-in.) and 4½ mi. of tar (2¾ mi. of 5-in. and 1¼ mi. of 4-in.) In addition to the mixing plant, the contractor operated five Caterpillar motor patrols with 12-ft. blades, four 45-hp. gasoline units and one 55-hp. diesel machine, two Bros dual sheepsfoot rollers drawn by Caterpillar 40-hp. diesel tractors, two Bros pneumatic-tire rollers loaded to 7 tons and inflated to 45-lb. tire pressure, one Bros pull-type flat roller filled with water to produce a pressure of about 150 lb. per linear inch, and four pneumatic-tire farm tractors, two Allis-Chalmers and two McCormick-Deering, to pull the latter equipment.

Oil and Water

On the traveling mixing plant was mounted a 625-gal. tank for bituminous material. Water was fed to the spray bars by a centrifugal pump which drew it from a 700-gal. trailer tank attached to the plant at one side. The trailer carried a pump which refilled the tank from a 1,000-gal. water relay truck.

Two 1,000-gal. relays transported bituminous materials from a railroad siding near the east end of the two sections. A Cleaver-Brooks heater was used in pumping tar, but no heat was required in unloading the asphalt emulsion.

Mixer Progress — Construction by the traveling mixing plant was rapid, 5-in. tar being completed at the rate of 1 mi. in 30 hr. and 5-in. asphalt emulsion at the rate of 1 mi. in 40 hr. Whenever possible, the plant operated 24 hr. a day.

For tar mixing, 4 per cent of RT3 by weight, based on dry weight of material in the windrow, was added to the soil. The material could not be mixed at moisture contents of 12 to 16 per cent because of the stiff nature of the mix; 16 to 20 per cent proved satisfactory. Optimum moisture content for compaction was 8 per cent, and the contractor held the mixing water to a minimum, adding only 9 to 10 per cent in order to reduce evaporation time and facilitate construction. As much as 16 to 17 per cent water could have been added to the tar mixture without adverse effect on the completed roadway.

Asphalt Emulsion

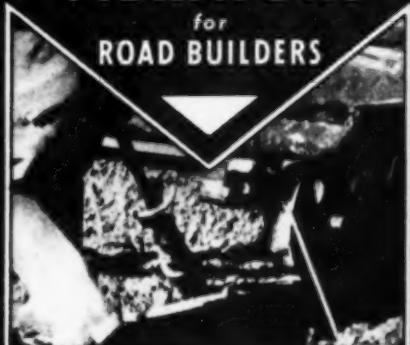
With the emulsified asphalt mix the contractor had to be careful not to add too much water, as the mixed material lacked capillarity, making it difficult for the water to evaporate and causing the surface to crack, when too much moisture was present, before the bottom set up. In the emulsified asphalt mixture optimum moisture content for compaction and density was 10 to 11 per cent. As the mixture derived some moisture from the emulsion when it broke, the contractor added only 9 to 10 per cent water at the mixer.

Slow-breaking emulsion containing 60 per cent asphalt was used. Based on dry weight of soil in the windrow, the engineers adjusted the control apparatus to

(Continued on page 116)

VIBRATORS

for
ROAD BUILDERS



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you'll see...

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for vibrating joints and side forms.

THE JACKSON "HYDRAULIC"—
for culverts, crossovers and edges.

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for bridge decks or flat slabs.

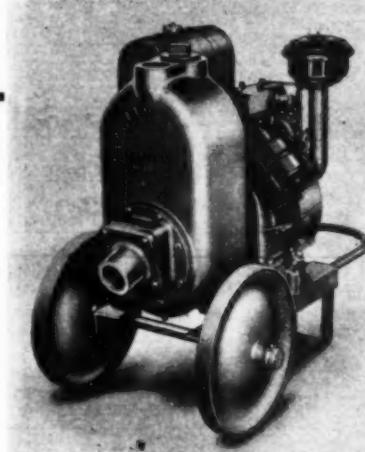
THE JACKSON PAVING TUBE—
for full width slab vibration.

THE JACKSON BACKFILL TAMPER
for tamping all earthfills.

THE JACKSON POWER PLANTS—
for operating vibrators or flood lights.

ALL MANUFACTURED BY
ELECTRIC TAMPER & EQUIPMENT CO.
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Inspect this startling new pump at our Booth Q-4 and you will be convinced of the truth of the above statements.

As always the most pump for the least money.

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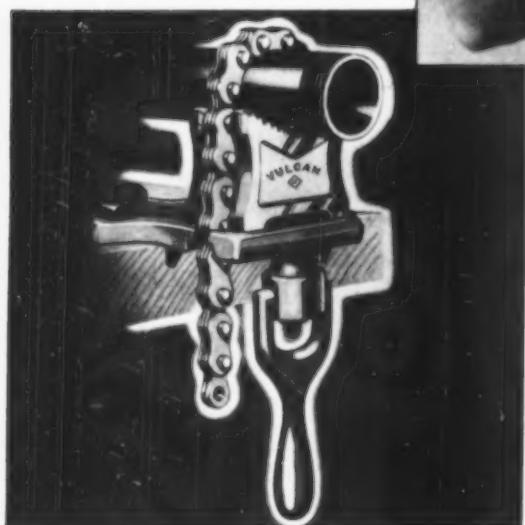


- These pictures, snapped in Milwaukee recently, indicate the universal application, and the general acceptance of the Barber-Greene Tamping-Leveling Finisher.
- Lincoln Memorial Drive, fifty-four feet wide, is a beautiful example of the Barber-Greene's joint-matching ability.
- The downtown job demonstrated the speed. The entire job, binder and top courses, (hot sheet) was completed in less than a working day.
- The residential job shown included dozens of man holes, and a number of safety islands, but was performed with the minimum amount of hand spreading.
- In paving playgrounds, the Barber-Greene showed its maneuverability, and economy, even on small jobs which necessitate short runs.
- This machine is a most profitable investment. Its ingenious basic principles, mechanical superiority, and outstanding accomplishments are clearly described and illustrated in our 36 page booklet. Send for your copy, there is no obligation.

BARBER  **GREENE**
AURORA ILLINOIS 39-27

"VULCAN SUPERIOR" HANDLES Both PIPE AND FITTINGS

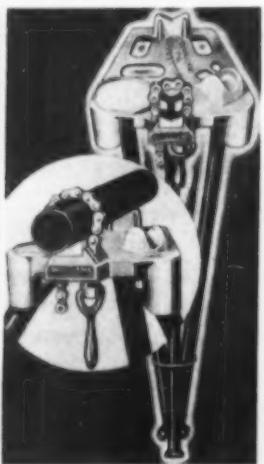
"VULCAN SUPERIOR" TONGS. 7 sizes, with either Flat or Cable Chain, for pipe and fittings, $\frac{1}{2}$ to 12".



"VULCAN"—the original chain pipe vise—small—compact—unbreakable. 4 sizes for pipe, $\frac{1}{2}$ to 8".



"VULCAN" CLAMP KIT Vise—same design, attaches anywhere without bolts.



"VULCAN" VISE STAND—equivalent of Vulcan Vise No. 1 with portable stand and pipe bender combined in a single unit.



"VULCAN SUPERIOR"—"Overhead" adjustment—Jaws reversible for wear. Faster and more convenient. 2 sizes for pipe, $\frac{1}{2}$ to 4 $\frac{1}{2}$ ".

J. H. WILLIAMS & CO.

HEADQUARTERS FOR

225 LAFAYETTE ST., NEW YORK



(Continued from page 114)

add 5.1 per cent by weight of asphalt emulsion at the mixer.

Certain advantages were apparent in the bituminous construction. Among them were the fact that no headers were required at construction joints and the fact that the roadway could be worked several days after laying merely by adding water.

Administration—A. C. Tilley is state engineer of Nebraska, and A. T. Lobdell is chief of the Bureau of Roads and Bridges in the Department of Roads and Irrigation. Work on the experimental soil-processing contracts was under the direction of D. C. Erickson, project engineer.

For the two contractors, Fred Morgan was superintendent on soil-cement construction for the Inland Construction Co., Omaha, Neb., and J. M. Gribble was superintendent in charge of bituminous sections for Lee & Johnson, Inc., Sioux City, Iowa.

★ ★ ★

DIVISIONAL FIN

Promotes Traffic Safety

(Continued from page 49)

scribed islands and two turn-off islands at 47th St. extended are six separate strands of yielding cable, so arranged as to act as a positive divisional fin without the dangers of fixed types of curbs used on ordinary divisional fins. Cars striking this new type of fin would be deflected back into their proper channel by the yielding cable and would not jump the curb, as is the custom on ordinary fins, frequently causing drivers to lose control of their cars.

★ ★ ★

Reflecting Curbs

GUIDE

NIGHT TRAFFIC

(Continued from page 85)

to 12 in. They are delivered to the job in trucks, unloaded by crane and placed in final position by four men equipped with a pair of carrying tongs.

The slant type curb was developed for and has been used to great advantage on 3- and 4-lane undivided roadways which have been converted into the divided type. In some cases the curbs have been laid back to back, forming a narrow island, and in others a dark corrugated concrete island paving has been placed between the backs of the curbs, all of which rest on the old concrete pavement. To obtain the necessary space for two lanes of moving traffic on each side of the island, the pave-

(Continued on page 118)

HERE'S THE LEADER OF BYERS' LINE-UP FOR 1940

See it in action and at the Chicago Road Show

JAN. 25th TO FEB. 2nd 1940



FAST · POWERFUL 36,000 LB. "83"
BYERS 3/4 YD. 83

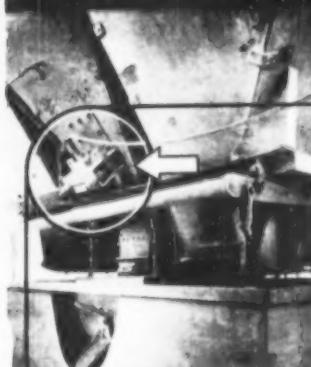
THE BYERS MACHINE CO., RAVENNA, OHIO — Specializing in $\frac{3}{8}$ - $\frac{1}{2}$ - $\frac{5}{8}$ - $\frac{3}{4}$ YD. CAPACITIES

Particularly when the weather's against it...

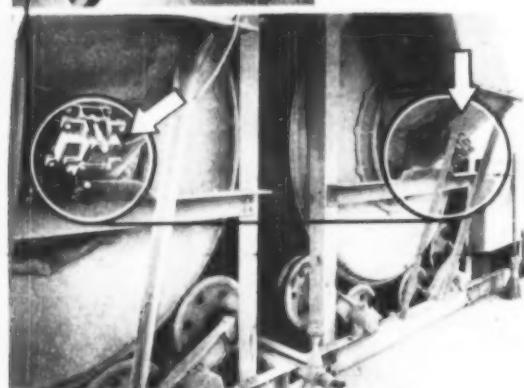
SYNTRON

PULSATING ELECTRO-MAGNET HOPPER VIBRATORS

HELP SPEED THE JOB!



WITNESS THESE Profit-Increasing INSTALLATIONS



Assuring a free and uninterrupted flow of material from supply hoppers to mixers on the Havre de Grace bridge job was simply and efficiently solved through the use of **SYNTRON Pulsating Electro-Magnet Hopper Vibrators** at several strategic points. In the upper photograph, you see one such vibrator attached to the cement hopper. Similarly two other vibrators are applied on the far sides of the sand and aggregate hoppers, thereby maintaining an equally fast flow of these materials into the Batch Weigh Hopper below. **SYNTRON Vibrators** also were mounted, one each as shown in the bottom view, on the supply chutes of the two big concrete mixers. This second installation eliminated the tendency of the batch to hang up in the chutes and, combined with the hopper vibrators, has improved the performance of the mixers as much as 25% to 50%.

Many other applications of **SYNTRON Electro-Magnet Hopper Vibrators** are possible. For instance, their use on any hopper assures you not only of a quick discharge, as above, but a complete emptying of all fines, too. Also, attached to long concrete chutes from elevated towers, a smooth speedy flow of mixed concrete is likewise assured. Surely, such opportunities as offered by **SYNTRON Vibrators** for speeding the job, are worth investigating! They give 24 hour per day duty, are outfitted with rheostat control, for adjusting their power, and come in various sizes. Write today for complete details.

SYNTRON CO.

500 No. Lexington Ave.

HOMER CITY PENNA.

(Continued from page 116)

ment has been widened. The corrugated dark concrete in the island not only affords a marked daylight contrast but at night appears jet-black because the corrugations are designed to deflect from the approaching driver's eyes all rays of light, whether from one's own or approaching headlights, or any overhead lighting. These corrugated surfaces are either cast in place or precast.

been specified in 18 contracts covering about 40 mi. of road.

Several of the accompanying photographs illustrate steps in the process of precasting the curb sections at the plant of the Porete Manufacturing Co., North Arlington, N. J. Into concrete molds, formed on the bottom to produce the depressed faces for light reflection on the finished face of the curb, the mix of Atlas white cement is poured from a chute and spread with a plasterer's float so as to line, but not completely to fill, the form. After the white concrete has been vibrated, steel reinforcement is placed and the form is filled to its top with normal gray concrete which forms the body or core of the slab. After a second vibration the top surface is screeded off and hand-finished. The curb remains in the mold 24 hr. It is then removed, cleaned and placed on a steam floor where, during a curing period of 4 days, it is wetted every 2 hr.

White-Faced Curb

In either type curb the exposed surface embracing the series of reflecting faces is made of Atlas white cement concrete—2 in. thick in cast-in-place curb, and from $\frac{1}{2}$ to 1 in. thick in precast curb. Both are backed up by gray concrete. The mix specified for precast curb is 1:5 $\frac{1}{4}$, with a ratio of fine to coarse aggregate between 50 and 67 per cent, the fine aggregate being a white quartz sand. The mix for cast-in-place curb is 1:1 $\frac{3}{4}$:3 $\frac{1}{2}$. The curb has

★ ★ ★

Deep Open Cut REMOVES CALIFORNIA HIGHWAY TUNNEL BOTTLENECK

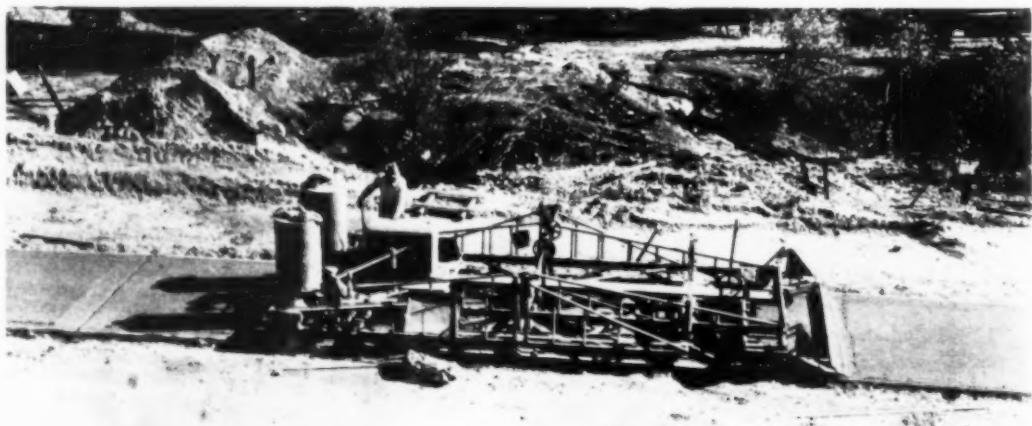
(Continued from page 66)

erly side by nearly vertical planes more or less parallel to the direction of dip and that movement of the sliding mass was along the direction of dip, which formed an oblique angle with the roadway gutter line. The slip planes intersected the gutter line at various points throughout a distance of about 800 ft.

To determine the limits of material required to be removed in order to stabilize the cut slopes, planes with a $\frac{3}{4}:1$ slope were passed through the intersections of the slip planes and the gutter line and on a line approximately 10 deg. back of the direction of slip. All material north of

these slope planes, down to the surface of the slip plane was removed. By this method the material remaining south of the slope planes and below the slip planes was supported at the toe, and the total amount of material removed was much less than if a uniform slope of sufficient flatness to stable had been adopted. The result of this procedure in removing unstable material is a series of sawtoothed peaks or ridges with valleys intersecting the gutter line. The westerly slope of the tunnel cut has remained stable on the $\frac{1}{2}:1$ slope to which it was originally designed and constructed.

(Continued on page 120)



CONCRETE PAVEMENT SLABS 11 ft. wide, forming outer lanes of Newhall cut are finished with Johnson mechanical drag float.

MAKE MORE MONEY THIS WAY on drainage and sewerage jobs

ARMCO catchbasins, manholes and many other fittings are prefabricated to save you time and money. They're delivered to the job ready for easy installation.



Long sections of ARMCO Pipe are easily handled with only ropes and plank skids. Winter weather can't stop installation.

• It is no trick to keep on schedule when you use ARMCO Corrugated Metal Pipe for drainage and sewerage contracts. Because it is easy to handle and install in any kind of weather you can speed work and avoid costly delays. This means money in your pocket.

Remember, ARMCO Pipe is easily installed by unskilled labor. Ordinary care in preparing a foundation assures accurate grade and alignment. Strong, tight connections are quickly made with simple tools. No costly "curing" is needed; and no protection or heating during construction in cold weather.

The flexible corrugated design of ARMCO Pipe provides ample strength without excessive weight. Long lengths (20 to 30-foot) can safely be handled without heavy equipment. Transportation costs are low. These longer lengths mean fewer joints, less assembly work. And there is little chance of damaging ARMCO Pipe in handling, thus eliminating time lost in replacing sections.

Try ARMCO Corrugated Metal Pipe on your next job. This way you'll keep ahead of schedule, under the estimate, and make more money on the job. Ask the ARMCO man to give you prices and complete information. Or write directly to Armeo Drainage Products Association, 502 Curtis Street, Middletown, Ohio.



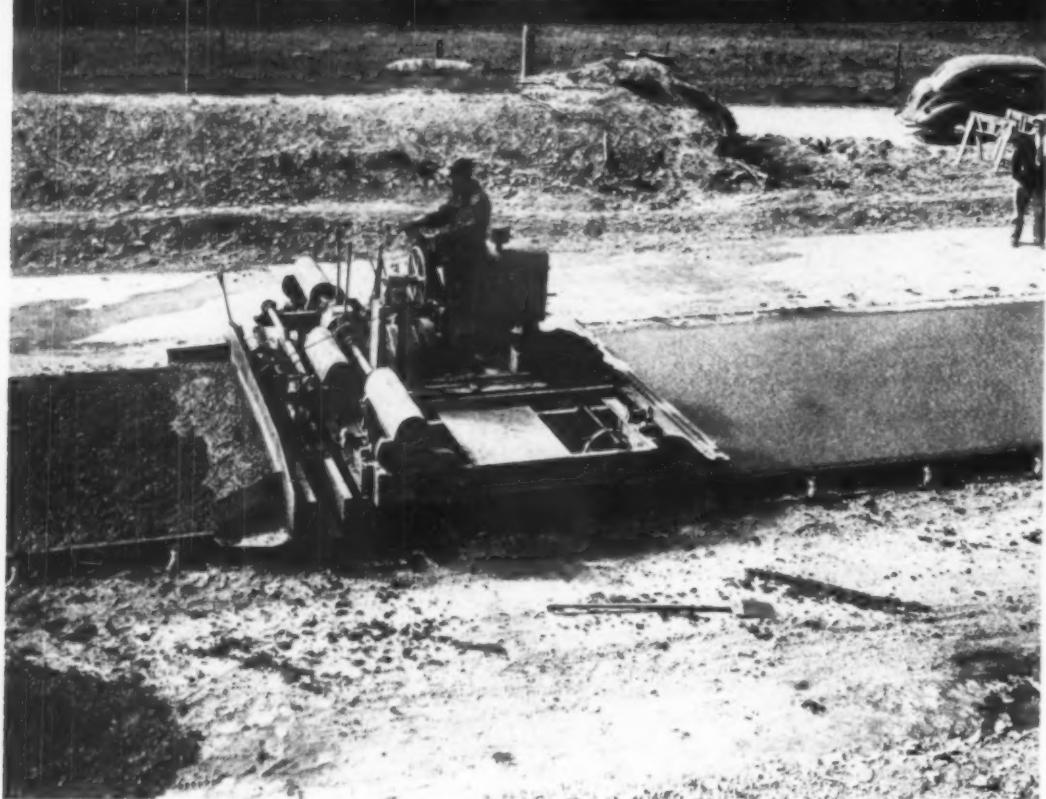
ARMCO
CORRUGATED
METAL PIPE

PLAIN GALVANIZED • BITUMINOUS PAVED AND COATED



Where interference with traffic must be considered, you can install pipe under railroads, highways and street intersections by ARMCO's simple jacking method.

"1940 — NEW THINGS TO SEE — 1940"



... On the Pennsylvania Turnpike"

See one of the "FLEX-PLANE" 24 foot finishing machines at work with SECTIONAL SCREED — finishing 1" slump concrete. See the first full width 24 foot SPREADING MACHINE ever made—spreading a mass of concrete 30" high without screws. See the "FLEX-PLANE" direct screed starters, which check sidesway. See the new "FLEX-PLANE" LEANING SCREED WINGS. See the "FLEX-PLANE" GAS ELECTRIC and VIBRATED SCREED, joint installing machines, etc.—All sizes and kinds to suit your job. Some of these improvements at the Road Show BOOTH P-9.

FLEXIBLE ROAD JOINT MACHINE CO.

WARREN, OHIO

(Continued from page 118)

The preliminary estimate of roadway excavation for the area in which the heavy slides occurred was 295,000 cu.yd. on the basis of the designed $\frac{1}{2}:1$ slopes. The slide yardage removed amounted to 316,000 cu.yd. making a total of 611,000 cu.yd. of material removed in the construction of the tunnel cut.

On the remaining portions of the roadway little difficulty in excavation was encountered, although some of the cuts reached 100 ft. in height and required considerable drilling and blasting to bring material down to the roadway where it could be loaded into trucks with power shovels.

The preliminary estimate of excavation quantities for the entire 3.7 mi. of the project was 520,000 cu.yd. and the final quantities showed that approximately 857,000 cu.yd. were removed, an excess of 337,000 cu.yd., nearly all of which came from the tunnel cut.

Asphalt-Lined Drainage Ditch

Other features of the contract such as the plant-mixed surfacing, portland cement concrete pavement and shoulder treatment followed more or less standard practice. The construction of a paved drainage ditch along one portion of the project, followed, however, experimental lines. The ditch was built on a curved section and paved with asphaltic concrete reinforced with wire mesh. The length of the ditch was about 300 ft. and has a top width of 39 ft. with the flow line 6 ft. below the top. The section is curved, with a radius of 35 ft. The grade of the ditch was finished by hand trimming using a circular templet and compaction of the sub-grade accomplished with an 8-ton tandem roller. The asphaltic concrete was spread and raked by hand and compacted by the tandem roller.

After 1 in. of the surfacing was in place the wire mesh reinforcement was laid and the remaining pavement material placed and rolled. The finished thickness of the pavement was 3 in. Aggregate for the surfacing provided 100 per cent passing a 1-in. screen, 65 per cent passing a No. 3 sieve and 4 per cent passing the 200 mesh. Six per cent of Grade D asphalt was the binder. While the California Division of Highways has constructed many miles of various types of paved drainage ditches, the use of wire mesh reinforcement with asphalt concrete is an experiment and the service which this ditch renders during the storms of the next few winters will be watched with interest.

Personnel

Supervision of the design and construction of the project was under S. V. Corratelyou, district engineer and E. L. Seitz was resident engineer in direct charge of the work. The contractor was Griffith Co., of Los Angeles. The entire project cost \$475,700 of which approximately \$191,000 was for roadway excavation.

The highway is an example of that large class of roads which are not main

(Continued on page 122)

FROM ROD

TO ROPE



MADE TO MAKE GOOD

From the approved hot rolled wire rods thru Macwhyte's furnaces, cleaning, baking, cold drawing of wire, and fabrication of wire into wire rope—at every step of the way Macwhyte Wire Rope is made to make good.

ASK FOR A MACWHYTE WIRE ROPE RECOMMENDATION

IT'S LABORATORY TESTED . . . Not just ordinary, routine tests, but *exacting, severe* tests . . . many of them . . . are given all Macwhyte ropes. Which means that when they're given a "final OK" at the mills, Macwhyte Wire Ropes are ready for dependable, economical service.

AND IT'S FIELD PROVED . . . On all kinds of jobs, on all kinds of equipment, under all kinds of conditions, Macwhyte ropes are constantly being proved. All year long, Macwhyte Engineers out on the job are constantly proving, improving, perfecting the right wire rope for your specific job.

NO. 426

MACWHYTE COMPANY
KENOSHA, WISCONSIN

Manufacturers of wire rope and braided wire rope slings. New York Chicago Pittsburgh . Ft. Worth . Portland . Seattle . San Francisco . (distributors throughout the U.S.A.)

MACWHYTE

Whyte Strand - PRE formed WIRE ROPE

BALANCED



Equipped with
Solid Rubber
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Features:

HARD MAPLE HANDLES
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WELDED TRAYS — NO RIVETS
LARGER TRAY ROD — BUTT WELDED
V-FRONT BRACES — CROSS SUPPORT
CHANNEL STEEL LEGS WITH SHOES



Where tray sheets lap, both sheets are folded around the butt-welded rod in top edge, forming double reinforcements, as shown by the cross-section at the left. This is an extra Sterling value.

STERLING WHEELBARROW CO. MILWAUKEE, WIS.

THE RIGHT JACK

Saves TIME

Saves LABOR

Speeds CONSTRUCTION

Your work goes faster when you have the **RIGHT** jacks at hand. From the more than 300 different Duff-Norton styles and sizes you can select jacks especially suited for each class of lifting, lowering and holding jobs you encounter. A Duff-Norton specialist will help you pick the ones you should have for speed and economy of construction.

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A Few of the more than 300 Sizes and
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Ideal for low loads in
cramped quarters, as well
as normal loads, this Auto-
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many construction applica-
tions. Sizes, 5 to 20 tons.



Where great power com-
bined with ease of operation
is desired, the Duff-Norton
Self-Lowering Speed-Con-
trolled Jacks serve depend-
ably and efficiently.



Trench Braces, Push and
Pull Jacks, Pipe Forcing
Jacks are other Duff-Norton
items used by
construction engineers
to save time and money.

(Continued from page 120)

inter-city arterials but which are called upon to carry relative large volumes of traffic with high peaks of density. The construction standards are typical of present California practice on these important thoroughfares.

★ ★ ★

Traveling Plant LAYS SAND-ASPHALT COLD MIX

(Continued from page 57)

of 3.85 to 4.9 per cent for the project, variations being made as changes occurred in the sand grading.

Mixing was started on the White Lake end of the project on May 9, 1939, and progressed toward Atkinson. The mixing was completed on Sept. 8, 1939. During the four months that the mixing was being done, the rainfall exceeded the average for these months by 2 in., according to the records of the nearest weather bureau. As the average rainfall for this period is slightly in excess of 1 in. it can be seen that the mixing on this project was performed under extremely difficult weather conditions. The average amount of moisture in the sand at the time of mixing was approximately 4½ per cent.

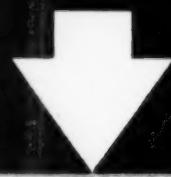
The cut-back asphalt used on the project was purchased from The Texas Co. and was hauled from their terminal in Wilmington in a 3,700-gal. tank mounted on a semi-trailer truck. The contractor had a 12,000-gal. reserve storage tank on the project and the asphalt was kept at the desired temperature by using a tank-car heater at the storage tank. Four supply tanks with a capacity of 1,000 gal. each were used to transport the asphalt from the storage tank to the mixer.

On the first 4 mi. of mixing, Grade RC-2-B asphalt was used. This material has a viscosity at 122 deg. F. of from 250 to 400. As the weather became warmer it was found that a heavier material could be handled satisfactorily and the remainder of the project was constructed with RC-3 with a viscosity of 275 to 400 at 140 deg. F.

Sand Windrowed for Traveling Plant

The sand for the bituminous mixture was windrowed in the center of the grade and a windrow shaper was used to determine the approximate amount of sand necessary. The mixing plant operated along the road picking up the sand from the windrow and depositing the mixed material in another windrow directly behind the machine. The windrow shaper had no direct bearing on the quantity of mixed material as this was controlled entirely by the size of the opening of the gate located at the bottom of the sand bin on

A common road problem



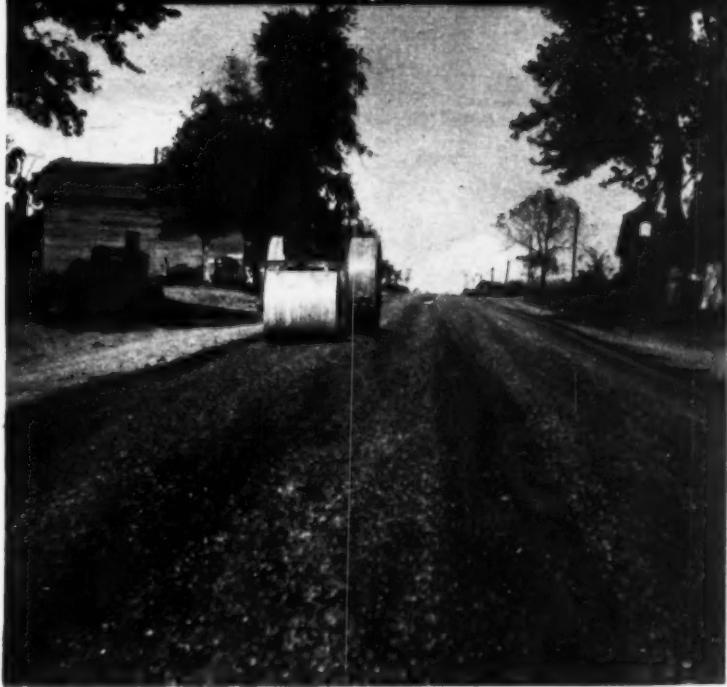
The former loose, dusty gravel surface of an 18-mile highway in vicinity of Lincoln Log Cabin State Park, Illinois.

An 18-mile highway near Lincoln Log Cabin State Park, Illinois, had a loose, dusty gravel surface.

How to convert this road into an all-weather, skid-proof, easy-riding highway at moderate cost was the problem.

Illinois decided that an Intermediate-Type Asphalt surface fulfilled all the requirements. The old road was primed with a suitable Cutback Asphalt. A plant-mixed surface of Cutback Asphalt and stone

And how it was solved



The same road during construction of a low-cost Intermediate Type Asphalt surface.

was machine-spread to a loose thickness of 3 inches and rolled. Then followed a tack coat of Cutback, a layer of coated keystone and two applications of Cutback, each of which was sanded.

There is an important place for low-cost Intermediate Type TEXACO Asphalt surfaces in every road and street system. For a helpful description of these surfaces, write for our booklet "Asphalt Roads—Intermediate Types."

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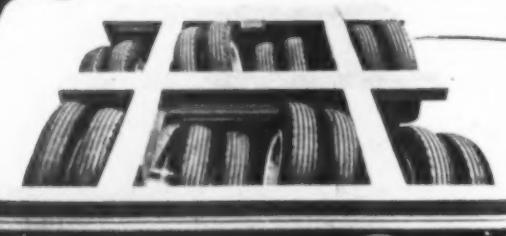
The New 1940 Line of
WILLIAMS Buckets
featuring **WELDED**
ROLLED STEEL CONSTRUCTION

What Wellman did for the Steel Industry,
they now do for the Construction Industry!

See these Improved Buckets and learn the
broader guarantees behind them at
SPACE H-6—1940 ROAD SHOW
CHICAGO • JANUARY 29—FEBRUARY 2

built by
THE WELLMAN ENGINEERING CO.
CLEVELAND, OHIO

you can



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finger on

**the SUPERIOR FEATURES
of A ROGERS TRAILER**

60% of the load is carried on the rear and 40% on the front. Each end is equipped with sufficient rubber to justify the trailer rating.

Rogers offers trailers as large as 60 tons capacity, with a width of only 8 feet yet accommodating sixteen-7.50x18 fourteen ply tires at the rear. To provide greater headroom clearance, the deck may be as low as 22 inches.

Unrestricted axle oscillation in multi-wheeled trailers gives greater stability of the load and permits each tire to carry its proportionate share of the load. Note example above.

Patented Brakes provide maximum safety with exceptional ease of control. Brake "walk" and brake "grab" are eliminated, even under extreme axle oscillation. The system combines power and manual control.

ROGERS BROTHERS CORPORATION
220 ORCHARD ST. ALBION, PA.

•EXPERIENCE built it...
•PERFORMANCE sold it...



(Continued from page 122)

the mixer. If the windrow in the front of the machine contained more sand than was needed for the mix, an overflow spout on the sand bin would waste the excess material to the side of the road. The mixer operator only had to watch the gage on the sand bin to be sure that it contained sufficient sand at all times. When the sand ran low in the bin, this indicated that the windrow in front of the machine was defi-

SAND GRADING

PASSING	RETAINED ON	STA. 110	STA. 1060	STA. 1190	STA. 1471
10 mesh	40 mesh	28.6	36.8	33.0	51.1
40 mesh	80 mesh	57.8	58.0	59.7	45.6
80 mesh	200 mesh	11.9	4.4	3.7	2.0
200 mesh		1.7	0.8	3.6	1.3

cient and the machine was stopped until the deficiency could be corrected. The mixer traveled at the average rate of 43 in. per minute. A 10-hour day's run, however, usually consisted of about 2,000 lin.ft. of mix.

Where the subgrade consisted of sand, the mixing machine would form ruts and it was necessary to use plank mats under the wheels and treads to keep the subgrade as smooth as possible. A heavy subgrade templet constructed of timber was pulled directly behind the mixer, thus leaving the grade in perfect condition when the mixed material was dumped on it. The size of the windrow of mixed material was checked at frequent intervals, adjustments being made in the machine to control the area of the windrow.

Mix Spread by "Snow Plow"

After the mix was deposited on the subgrade it was necessary to spread it and manipulate the mixed material in order to permit the evaporation of the naphtha and moisture. The initial spreading of the mix from the windrow was accomplished without placing any equipment directly on the sand subgrade. This was done by constructing an A-frame device on the front of an ordinary tractor-bulldozer. By making several trips with this bituminous "snow-plow" the windrow was spread to a width of from 16 to 18 ft. Then the aeration and spreading of the mixture was completed by the use of harrows, plows and graders. The spreading device was constructed by the contractor on the project and worked very satisfactorily. In order to prevent disturbing the edges of the subgrade and shoulders at points where the equipment was turned, timber mats were laid down and all turning was done on these mats.

After the evaporation of the moisture and solvent had progressed to the desired point, the sand-asphalt was finished with motor graders and final compaction was obtained by the use of rubber-tired and tandem smooth-wheel rollers. As soon as the pavement was thoroughly compacted, it was cored for depth, the tool used for

(Continued on page 126)



SEE THEM AT THE SHOW

If you take in the Road Show this year BE SURE to stop at the Galion booths where a cordial welcome and a complete line of road machinery units awaits you.

SEE—the new No. 201 motor grader with medium weight and power.

SEE—the Galion CYCLONE, a new self-propelled, high speed earth mover which DIGS—CARRIES—SPREADS, with 15 cu. yd. capacity and 100 H. P. diesel engine.

SEE—the most complete line of all-purpose rollers.

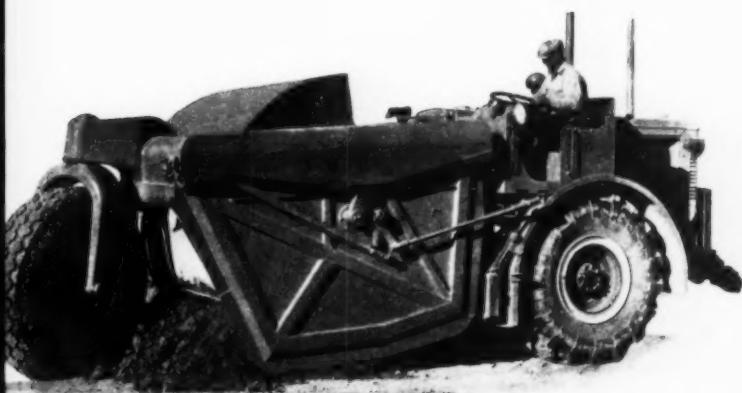
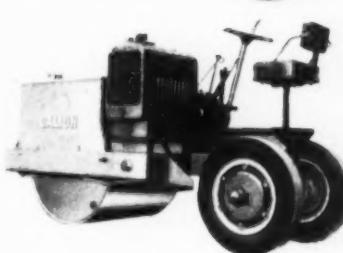
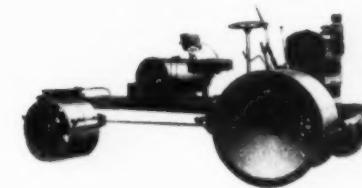
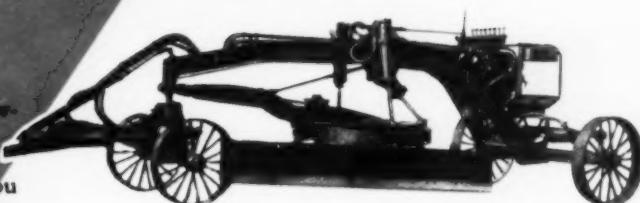
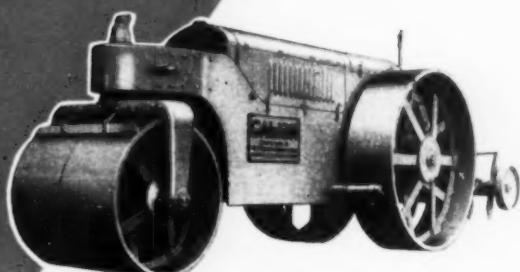
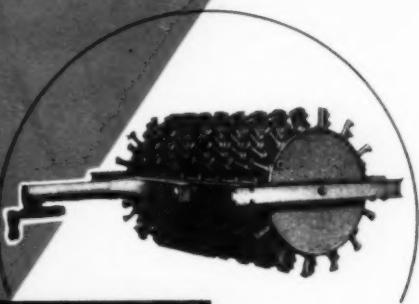
SEE—the big Heavy Duty 12 ft. motor grader built for the heaviest kind of construction and maintenance work.

In case you do not get to the show, we will be glad to send you literature covering any of the units shown here.

THE GALION IRON WORKS & MFG. CO.
GALION
OHIO

The new Galion No. 201 motor grader is shown left-above. At the right-above is shown the Galion tandem roller. Next is the 3-wheel roller, then the No. 120 pull grader, the trench and portable roller. The sheepfoot roller is shown at the immediate right and the new "CYCLONE" earth mover is shown below-right.

GALION
*Road Building
and Maintenance*
EQUIPMENT



**"There's the
BEST
dirt gone'
pump I ever
seen!"**

GUY VILLA & SONS, INC.
ENGINEERS AND
CONTRACTORS
WESTFIELD, N.J.
TEL. WESTFIELD 2-2857

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the
coupon**

"I put this Novo pump to work when I first started this job, and it has kept the whole excavation dry ever since. Many times we kept it running 24-hours a day—never less than 10. Day in and week out it throws out the water as it comes—thousands of gallons or just a trickle."

Guy Villa bought this 4" Novo Diaphragm Pump from the Smith Tractor & Equipment Company, the Novo Distributor at Irvington, N. J., and you should hear him sing its praises! Why shouldn't he with such performance? You would, too, with Novo Pumps on your job—

Novo Diaphragm Pumps operate on the old "fool-proof" principle but have been redesigned for easy portability, light weight and accessibility. Here's the pump for mucky, trash-laden water.

Then there are these Novo Self-priming Centrifugal Pumps—the ones that have jumped far into the lead in the pump field for performance, volume, fast priming time, and continuous service. They have two wear plates (one on each side of the impeller) for easy adjustment in case of excessive impeller wear.

Get the full information and prices. Novo Pumps are guaranteed to meet the A. G. C. Standards.

SEE them at the ROAD SHOW.
Booth S-13

NOVO ENGINE CO., 214 Porter St., Lansing, Mich.
Send me full information on Novo Diaphragm Pumps
Self-priming Centrifugal

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Address _____
City _____ State _____

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ENGINE COMPANY
LANSING, MICHIGAN
PUMPS-HOISTS-ENGINES
LIGHT PLANTS-STARTING UNITS

(Continued from page 124)

coring being made from an automobile tire pump and pipe fittings.

The specifications required that the edges of the pavement be cut to a true line, and in order to accomplish this the contractor designed a trimming device consisting of one disk from a disk plow, bolted on the end of the moldboard of a pull-type grader. The edge to be trimmed was lined off and marked with chalk, following

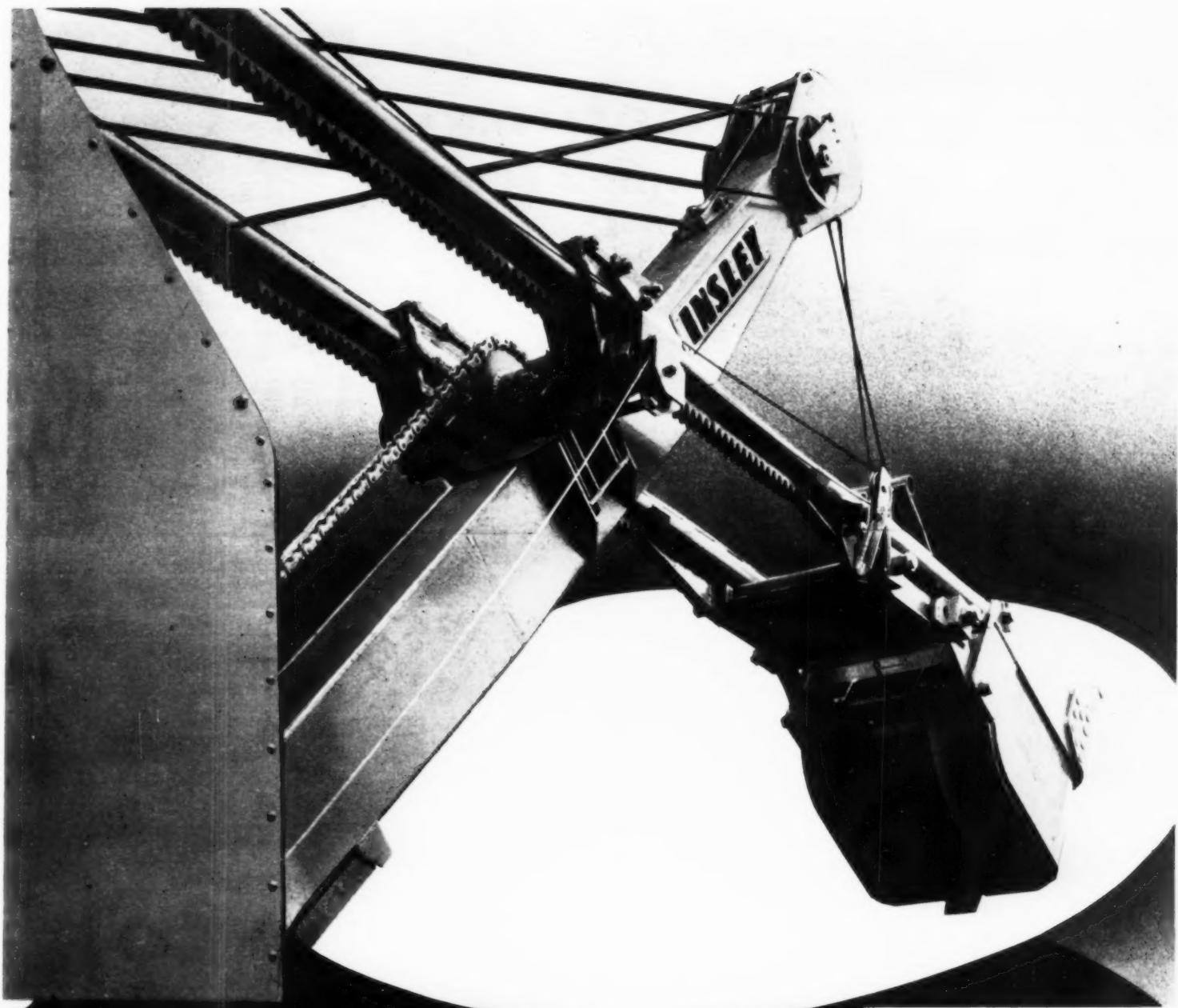


CORING PAVEMENT FOR THICKNESS is done with device made from automobile tire pump and pipe fittings.

which the grader equipped with the cutting device made a trip along the shoulder of the pavement opening up a trench slightly outside of the edge of the pavement. Following this a second trip was made with the machine, at which time the disk was kept on the line where the pavement was to be cut, with sufficient pressure applied on the disk to cut the pavement. In this manner the sand-asphalt material trimmed from the edge was deposited in the furrow prepared on the previous trip. The shoulder was then completed by blading the shoulder material up to the neat line of the edge of the pavement. Through the use of this device the edges of the pavement were trimmed at the rate of approximately 1 1/2 m.p.h.

In constructing the project, 708,200 gal. of cut-back asphalt was used, making average of 3.8 gal. per square yard. The cost of the pavement was 43.9c. per square yard.

C. P. Freeman was resident engineer and Dewey Hester and Roy Cain were inspectors on the project for the highway commission of which W. Vance Baise is state highway engineer. Fred D. Beasley was superintendent for the W. L. Cobb Construction Co.



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Road Shoulders MADE SAFE AT MINIMUM COST

(Continued from page 87)

ment consists almost totally of a sandy soil base stabilized with asphalt, with an inverted penetration wearing surface. In both types of construction the shoulders are built for a width of 5 ft. on a 1:24 slope, with a thickness of 3 to 5 in. for the stabilized bases and 6 to 8 in. for the topsoil or sand-clay.

Selected Soil Base Shoulders

In the selected soil base type of shoulder construction, the base is constructed of suitable selected sand-clay or topsoil material uniformly mixed and compacted, over which a double bituminous surface treatment is applied for a wearing course. The sand-clay used in the construction of the base is a naturally or artificially proportioned mixture of sand and clay, usually occurring in layers of considerable depth and meeting the following requirements:

	Minimum	Maximum
Passing 1½-in. screen (square opening)—per cent by weight	100	
Material passing No. 10 sieve and passing No. 10 sieve—		
Retained No. 60—per cent by weight	35	
Silt per cent by weight	10	
Clay per cent by weight	5	20
Material passing No. 40 sieve		
Liquid limit	25	
Plasticity index	10	

The topsoil used in the construction of the base is generally pebbly in character occurring in a surface layer usually from 6 in. to 18 in. in depth and is found on elevated areas. The material meets the following requirements:

	Minimum	Maximum
Passing 2½-in. screen (square opening)—per cent by weight	100	
Material passing No. 10 sieve		
Silt per cent by weight	50	
Clay per cent by weight	5	30
Material passing No. 40 sieve		
Liquid limit	25	
Plasticity index	10	

In the actual work of constructing the sand-clay or topsoil base the material in the shoulder is used if it meets the above requirements. In cases where it does not, the shoulder is excavated for a depth of 6 in. and backfilled with sufficient material to give a compacted thickness of 6 in. This sand-clay or topsoil material is mixed and shaped, using a plow or harrow and grader until the mix is homogeneous and, when compacted, conforms to the required cross-section. Pneumatic rollers are generally used to compact the base along with normal traffic. Upon completion, the base is

(Continued on page 130)



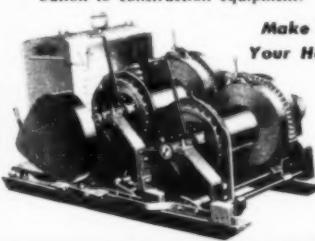
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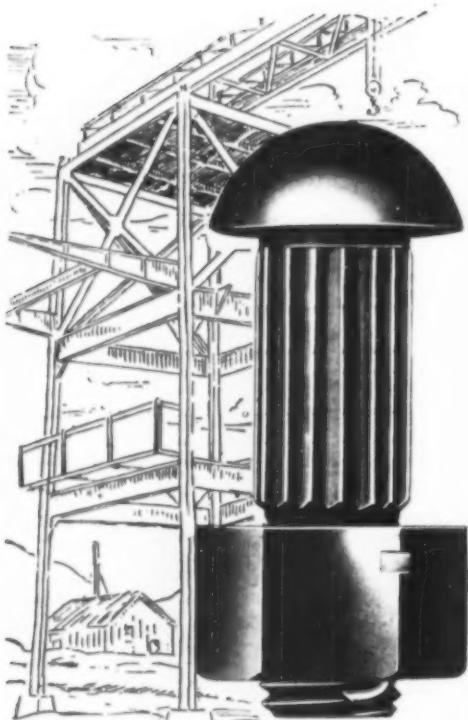
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AUTOMATIC NUT CO., INC.
Willow Plant Lebanon, Pa.

(Continued from page 128)

maintained with a road patrol for approximately 60 days, or until it shows no further signs of compaction. In some cases a sheepfoot roller has been used to obtain the required compaction.

The compacted base is swept free of all dust, and a tar prime (RT-2) is applied at the rate of 0.3 to 0.35 gal. per square yard. The bituminous materials are applied with a pressure distributor using a 5-ft. bar with a shield placed to prevent the tar from spraying on the adjacent pavement. The prime coat dries in from 2 to 6 days and hot asphalt (150-200 penetration) is applied at the rate of 0.4 to 0.45 gal. per square yard. This is covered uniformly with 40 to 45 lb. per square yard of $1\frac{1}{4}$ - $1\frac{1}{2}$ in. aggregate, using a mechanical spreader mounted on a truck. This aggregate is rolled with a 5-ton roller to insure proper seating.

The mat is cleaned after approximately a week and a seal, which consists of approximately 0.17 gal. per square yard of RC-type asphalt and 17 to 20 lb. per square yard of $\frac{1}{2}$ in., No. 16 mesh aggregate, is applied. After the aggregate is placed, it is swept with a drag broom until uniformly distributed over the surface and rolled with a 5-ton roller. RC-type asphalt is applied on top of this surface in sufficient quantities to bring the total of cutback asphalt applied, including the original coat, to 0.40 gal. per square yard. As it is nearly impossible to prevent traffic from using the shoulders long enough to give the cutback asphalt a chance to cure out, a light covering of sand is placed over the seal. The shoulders are complete after a second rolling of the surface.

Stabilized Base Shoulders

In the stabilized base type of shoulder construction, the base is constructed by uniformly mixing local sandy soil and cutback asphalt together, shaping and compacting the mixture. The asphalt used in this type of construction is a RC-type asphalt varying in viscosity, Saybolt Furol, from 80 at 50 deg. C. to 400 at 60 deg. C. This variation is to accommodate various methods of mixing and different weather conditions. The local soil used is a fine sandy soil containing little clay. A fine soil is preferable as it gives a more stable mix.

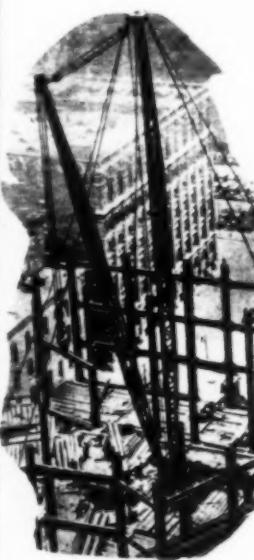
The shoulders are prepared for treatment by excavating with a grader for a depth of 3 to 5 in. in cases where the mixing is to be done with a plant and the mixed material hauled in. In cases where the mixing is to be done in place, sufficient material is added to the shoulders to give a compacted thickness of 3 to 5 in. when completed.

Two methods of mixing are used: The first method is used in cases where the material in place on the shoulder is unsuitable for stabilization and it is necessary to obtain suitable material elsewhere. A pugmill with a capacity of approximately 400 cu.yd. per day and mounted so that it can discharge directly into a truck body is erected in a borrow pit. This pugmill is fed by a crane and powered by a tractor. Approximately 15 gal. of RC asphalt is mixed with 1 cu.yd. of soil and mixed ma-



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material is hauled directly from the mill to the shoulders.

The second method of mixing is to mix the material in place using graders and harrow. In this case the shoulder material is scarified and pulverized to a uniform depth of 3 to 5 in. The asphalt is applied at the rate of 1½ to 2½ gal. per square yard with a pressure distributor and is cut in with a harrow. It is then mixed and shaped to the required cross-section, using small graders and a single harrow section mounted under a grader frame. It has been found that the amount of work necessary to shape the mixed material is sufficient to permit the escape of the volatiles in the cutback. The material is compacted with loaded trucks or a pneumatic roller. In some cases a sheepfoot roller has been used.

A finish is obtained with a small grader having a tell-tale device mounted on the blade to obtain a correct and uniform slope. Compaction is completed during the finishing operation.

A few miles of shoulders have been constructed using tar as a stabilizing agent. In this type of construction the material in place is used, as it is possible to stabilize a soil containing a higher clay content. The soil, mixed with 1.5 gal. per square yard of RT-5 tar, is brought to the optimum moisture content and compacted using a sheepfoot roller. A prime consisting of 0.3 gal. per square yard of RT tar is applied to this base.

Wearing Surface

After the stabilized base is firmly compacted, properly cured, cleaned and dried, a wearing surface is applied, consisting of 0.38—0.43 gal. per square yard of 150-200 penetration hot asphalt covered with 30-32 lb. per square yard of $\frac{1}{8}$ in., No. 16 mesh aggregate. The aggregate is spread uniformly over the base with mechanical spreaders mounted on trucks, and then rolled with a 5-ton roller to complete the shoulder construction.

On some asphalt stabilized bases a prime of RC asphalt has been applied with premixed material placed for a wearing surface. This premixed material consists of 50 lb. per square yard $\frac{1}{8}$ in., No. 100 mesh aggregate mixed with approximately 0.5 gal. of RC asphalt.

The program of surface treating the shoulders has been carried forward vigorously. At the end of December, 1937 a total of 75 mi. had been completed. At the end of December, 1939 approximately 900 mi. of the 2,000 mi. of shoulders on hard surfaced roads in the State will have been treated.

The cost of constructing the surface treated shoulders is shown below:

	Per Sq. Yd.	Per Mile (5 ft. wide each side roadway)
Asphalt stabilized base...	\$0.25	\$1,466.75
30 lb. inverted penetration wearing surface	0.10	586.70
Total	0.35	2,053.45
Topsoil or sand-clay base...	0.10	586.70
Double bituminous wearing surface	0.25	1,466.75
Total	0.35	\$2,053.45

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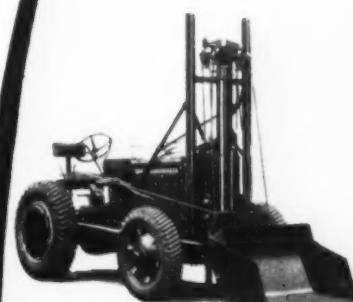
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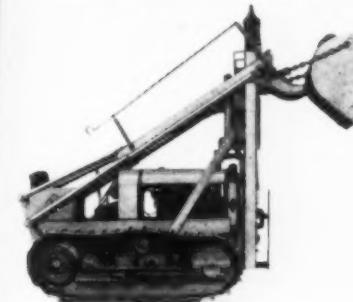


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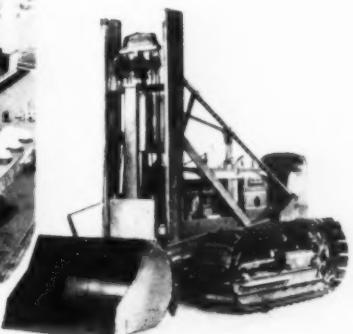
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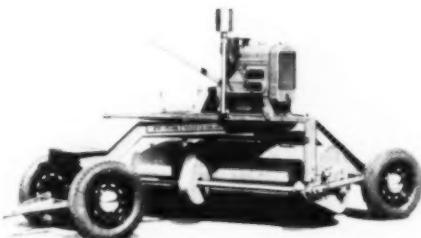
A-C CRAWLER SHOVELS



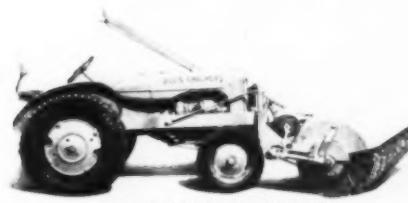
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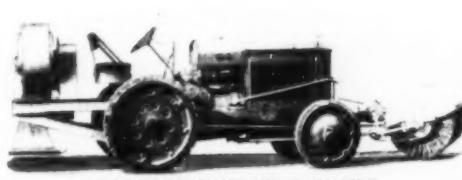
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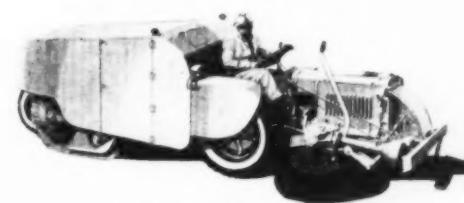
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FLAME CLEANING OF STEEL—**Air Reduction Sales Co.**, 60 East 42nd St., New York, N. Y. (8 pp., illustrated.) Discusses use of process for forestalling future paint flaking on new structural steel and plate. Diagrammatic sketch of entire operation of flame cleaning and dehydrating is supplemented by complete description of the operation and the way in which it eliminates flaking due to atmospheric oxidation and moisture, thus reducing maintenance costs. Photos show how torch is handled for various applications. Descriptions of the apparatus, procedure of operation, regulation of speeds and suggested specifications, also are included in the bulletin.

ARCHITECTURAL CONCRETE SLABS—**Universal Atlas Cement Co.**, 135 East 42nd St., New York, N. Y. (15 pp., illustrated.) "Beauty And Permanence With Concrete" is the title of this new booklet that illustrates and describes architectural concrete slabs, defined as precast reinforced units made in large, varied shapes with a white cement matrix to set off the exposed aggregates in their true colors and textures. They are used for interiors and exteriors, buildings and engineering structures, new work and remodeling. The publication includes descriptions of remodeled store fronts, the new Naval ship-testing basin, a commercial reception room, a two-story residence, and the Bahai Temple, in all of which architectural concrete slabs were used.

ELECTRIC TOOLS FOR MAINTENANCE JOBS—**Porter-Cable Machine Co.**, Syracuse, N. Y. (24 pp., illustrated.) A manual of pictures and text telling how maintenance operations on such materials as wood, metal and stone can be handled quickly and satisfactorily with such portable electric-powered tools as floor sanders and polishers, abrasive paint removers, electric saws for cross-cut, rip, bevel and dado work, abrasive disk machines for cutting stone and brick masonry.

PATROL SWEEPER—**Austin-Western Road Machinery Co.**, Aurora, Ill. (16 pp., illustrated.) Catalog contains 40 on-the-job operating photos showing what machine can do. Deals with costs; discusses working speeds; provides necessary descriptive information and specifications; covers types of service it provides; explains and illustrates adaptability for wide range of uses, and shows how various cities are meeting street cleaning problems.



MANUAL ON SOIL-CEMENT ROADS—**Portland Cement Association**, 33 West Grand Ave., Chicago, Ill. (90 pp., illustrated.) How to build low-cost roads for light traffic by mixing roadway soil with portland cement and water is told in detail in this manual. Soil-cement roads require careful laboratory analyses and tests of soils, coupled with studied construction procedure to assure their success. What these tests and procedures involve form the body of the manual. Both laboratory and construction procedures are simple. Subjects covered include: Details for laying out the project; an outline of tests required to insure success; desirable equipment and procedures; a model specification; cost data; and the detail information required for calculating control factors during construction.

★ ★ ★

WROUGHT IRON—**A. M. Byers Co.**, Pittsburgh, Pa. (97 pp., illustrated.) Revised edition of handbook on manufacture, characteristics and applications of wrought iron, by James Aston and Edward B. Story metallurgists. Concise history of wrought iron manufacture is followed by chapters on developments and research, quality standards, specifications and tests, characteristics, forging and bending, welding of wrought iron, principal applications and material selection.

★ ★ ★

PROCEDURE UNDER GOVERNMENT CONTRACTS—**Fidelity & Deposit Co.**, Baltimore, Md. (80 pp.) A monograph entitled "Matters of Procedure Under Government Contracts" by Col. O. R. McGuire, formerly counsel to the Attorney General of the United States, analyzing and interpreting rules and regulations which must be observed by firms and all others who enter into contracts with the Federal Government for construction work or for furnishing supplies. Includes references to many of the more important statutes and court decisions applicable to contracts with the United States. Advice which should enable the Government contractor to avoid mistakes in the performance of his contractual obligations. Subjects include the bid, the contract contracting agencies of the United States, contracts with Government corporations, settlement of claims and Government sales.

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CONVERTIBLE EXCAVATORS—**The Buckeye Traction Ditcher Co.**, Findlay, Ohio. (24 pp., illustrated.) Presentation of features and operating advantages of excavator, called "Clipper" with special attention to patented Buckeye "Mevac" metered vacuum power control system for all types of jobs. Adaptability of machine is shown by action pictures. Clipper is built in three sizes— $\frac{1}{2}$ -, $\frac{1}{3}$ - and $\frac{1}{4}$ -yd. capacities, convertible to shovel, trench hoe, crane, clamshell, dragline and piledriver.



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ROCK DRILL OPERATION—**Gardner-Denver Co.**, Quincy, Ill. (11 pp., illustrated.) A discussion of typical striking face failures of tappets and piston hammers and their relation to drill shanks or to worn chuck parts in the rock drill. Intended for superintendents, drill repair men, blacksmith foremen and blacksmiths. Demonstrates how attention to drill shanks will eliminate delays and reduce drilling costs.

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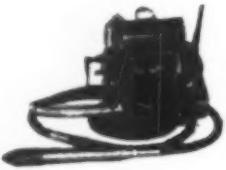
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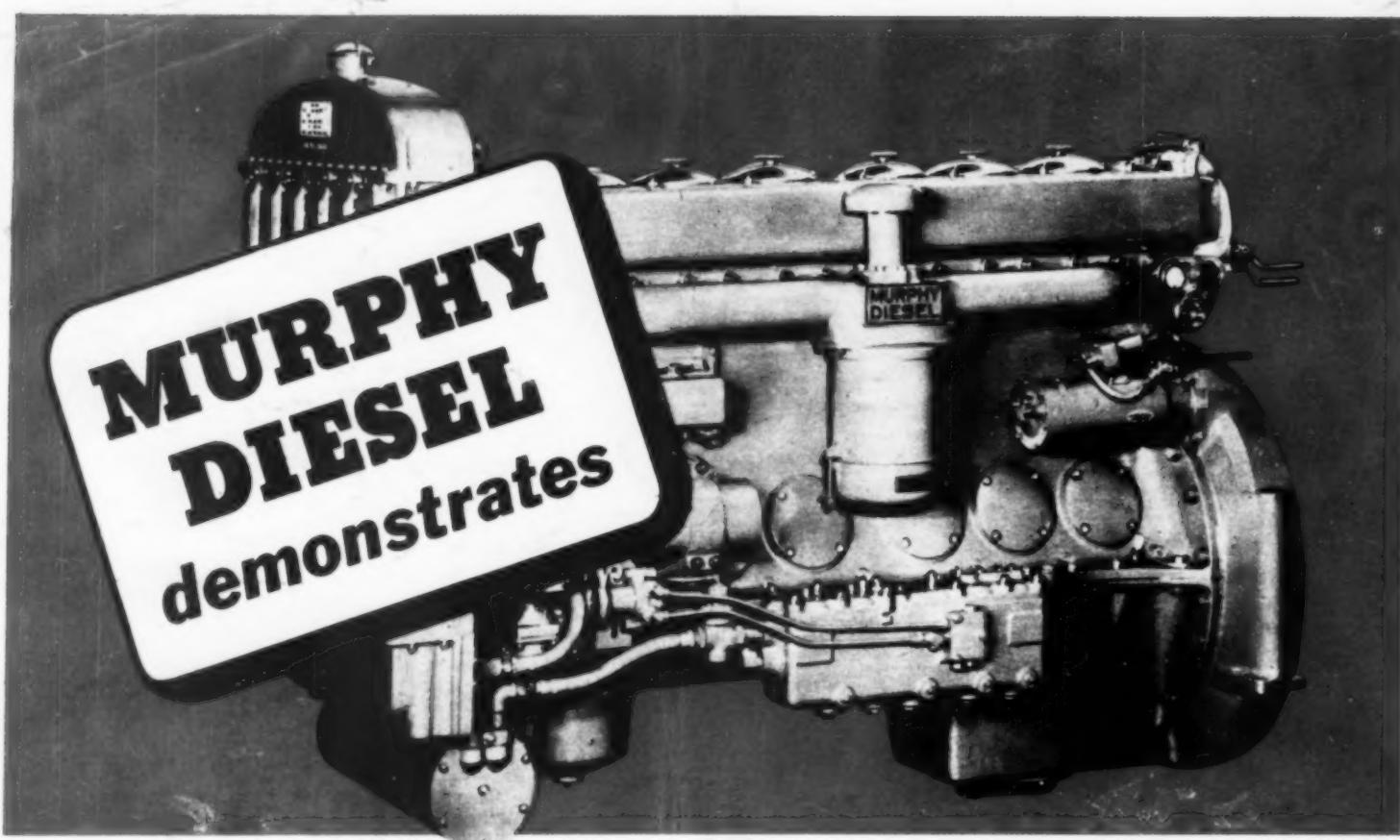
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